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ABSTRACT

This publication on human welfare and technological innovation contains two sections. The first section examines the objectives and functions of technological innovation while the second section discusses the direction and analysis of technology transfer between Japan and other nations. Subtopics within the first section include: (1) characteristics of technology, (2) human and environmental problems associated with technology, and (3) countermeasures to offset the problems of increasing technology. Section 2 contains five subtopics dealing with Japan's technology and its relationship to Asia and the world. These subtopics analyze problems stemming from the change in the industrial structure of Japan, examine Japan's role in the international division of labor and in the energy crisis, discuss the characteristics of Japan's science and technology and her relations with the United States and the industrialized nations of Europe, analyze relationships in the international division of labor in Asia, and discuss the need to develop a new scale for perception of environmental quality. (Author/DE)

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No. 2 • *Open Grants Papers*

HUMAN WELFARE AND TECHNOLOGICAL INNOVATION

EAST-WEST CENTER
Honolulu, Hawaii

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THE EAST-WEST CENTER is a national education institution established in Hawaii by the United States Congress in 1960. Formally known as "The Center for Cultural and Technical Interchange Between East and West," the federally funded Center is administered in cooperation with the University of Hawaii. Its mandated goal is "to promote better relations between the United States and the nations of Asia and the Pacific through cooperative study, training, and research."

Each year about 1600 men and women from the United States and some 40 countries and territories of Asia and the Pacific area work and study together with a multinational East-West Center staff in programs dealing with problems of mutual East-West concern. They include students, mainly at the postgraduate level; Senior Fellows and Fellows with expertise in research and/or practical experience in government and business administration; professional study and training participants in non-degree programs at the teaching and management level; and authorities in various fields meeting in international conferences and seminars.

A fundamental aim of all East-West Center programs is to foster understanding and mutual respect among people from differing cultures working together in seeking solutions to common problems. The Center draws on the resources of U.S. mainland universities and Asian/Pacific educational and governmental institutions, as well as organizations in the multicultural State of Hawaii.

Participants are supported by federal scholarships and grants, supplemented in some fields by contributions from Asian/Pacific governments and private foundations.

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HUMAN WELFARE AND TECHNOLOGICAL INNOVATION

Yujiro Hayashi

May 1974

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Part I

THE OBJECTIVES AND FUNCTIONS OF TECHNOLOGICAL INNOVATION

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1. Characteristics of Technology

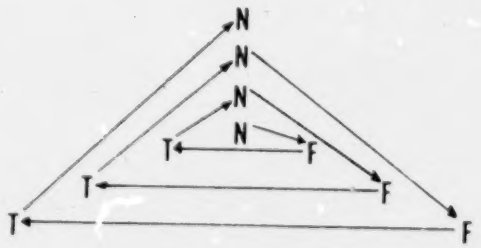
What is science? What is technology? These are the most basic questions to which we must first address ourselves. At the outset, it is patently obvious that neither science nor technology would have come into existence without the prior existence of mankind. The appearance of the human race was, in other words, the original cause behind the development of science and technology. But why did mankind develop science and technology?

As human beings were endowed with an intelligence quotient superior to that of other living creatures, they were able to perceive the many cause-and-effect relationships pervading the environment around them, laws and principles that clearly operated whether people were present or not. As such human observations accumulated, the body of science was created, and in due course people were able to put the laws of science to use in technical applications that satisfied needs of the human race.

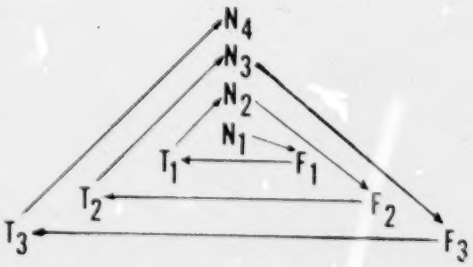
Technology thus inherently exists for improving human welfare, and under the circumstances it might seem paradoxical to review the relation between technology and human welfare at this stage. However, not all results of technological development have contributed to the welfare of mankind; rather, in many instances quite adverse effects have resulted. What, then, are the reasons why some technological developments have actually become objects of censure in present-day society? To clarify this apparent contradiction would be, in effect, to truthfully answer the basic question: What is technology?

Reviewing the relation of human needs to technology over the long history of mankind, we might represent it in the schematic manner shown at right.

N: Needs
F: Functions
T: Technology



If a function is that which is necessary in order to fulfill a perceived need, then technology is that which is necessary to realize operation of a function. New technology, however, also changes the environmental conditions of the society in which it is created, and changed environmental conditions then give rise to new human needs. Such newly perceived needs also require new functions for their fulfillment, leading in turn to still newer technology, which leads to newer environmental conditions, and so on in a continuous, spiraling relationship between needs and technology. To express this characteristic relation between needs, functions, and technology in finer detail, we may redraw our figure as shown.



The T_1 in the figure, occasioned by N_1, fulfills the needs at N_1 by definition. The needs at T_1, however, are no longer those of N_1 because these have been fulfilled and new environmental conditions have been generated. Rather, people living in the T_1 environment will feel new needs, N_2, and these needs will call forth new functions, F_2, new technology, T_2, another environment, and so on to N_4 and beyond.

What is important is that technology consistently expands both in scale and into new fields in this chain from T_1 to T_2 to T_3, etc., and as technology grows in scale

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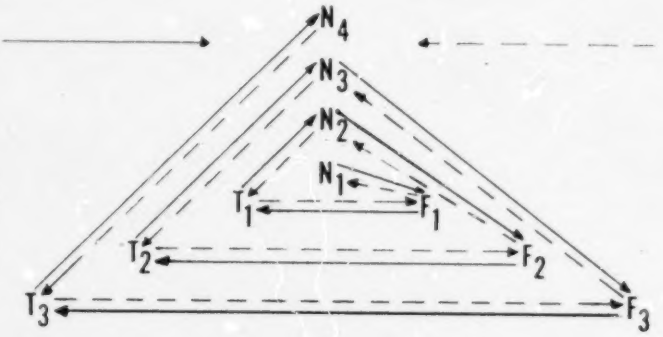
and scope it tends to become characterized by a certain fixedness or weight of its own. To eliminate any friction between human needs and this characteristic of technology, an even greater scope of technological development becomes necessary, moving into wider and more detailed fields. This process has continued to evolve and even accelerate, until today there are few areas of human life that have not been touched by technology.

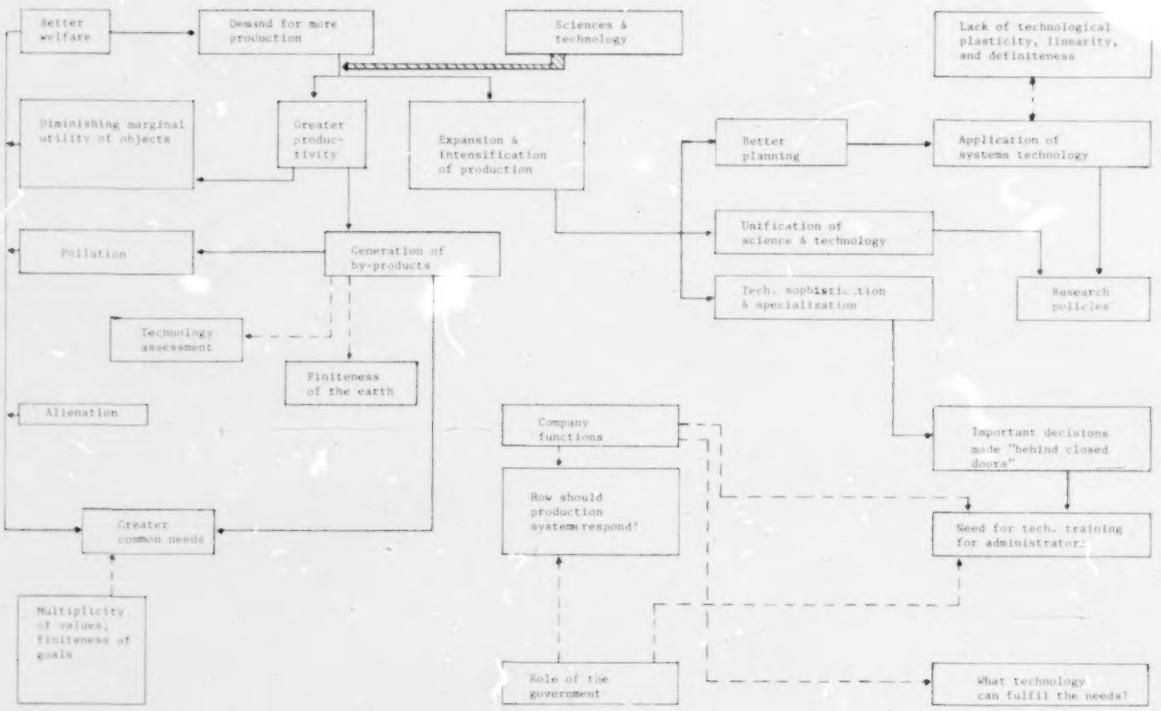
At this stage, technology must inevitably reach a sort of turning point where people review and rethink the questior What is technology? In rethinking this question people will try to come up with new courses for technological refinemen' reversing the pattern of past development. Schematically, we have tried to capture the new directions by modifying the figure introduced above to show a "feedback" flow of technology, a flow in the reverse direction of the pattern up until now of "forward feed."



The well-known proposals made recently by the Club of Rome, for example, are concrete instances of technology modification through feedback, and the growing calls for "technology assessment" might also be regarded as an indication of the same tendency. Needless to say, not all actual efforts in technology assessment have broken with the traditional pattern of forward feed development.

The relations between needs and technology at the present time are actually very complex. The following chart gives us a closer view of some of these relations.

Social Development and Science & Technology



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2. Themes

In the continuing course of expanding production capacity and increasing scope of technology, various contradictions arise between technology and the needs which originally called such technology forth. Consequently, new needs arise. In the following we will introduce some of the problematical points which prevail in present-day society.

2.1 Changes in Values

As material affluence reaches a certain level, there takes place a rapid change in values. First, the most direct change is a diminution of the marginal utility of physical objects. In short, the values of objects diminish as the degree of satisfaction they add to a feeling of affluence diminishes. This change in turn results in new standards of happiness and new measures of welfare. While happiness and welfare as abstract concepts are perpetual objects of human pursuit, their concrete expression in targets and goals cannot be fixed. But can technology cope with dynamic change in goals? Here we see suggested a limitation inherent in technology.

2.2 Human Alienation

One result of increasing production capacity tends to be greater consumption standardization; that is, products cannot be monopolized by a limited number of people but become available to everybody who is within the market network. Such standardization will, however, promote individualization at the same time, for even though everybody will come to use the same articles, each individual will apply to them his own particular scale of values. Consequently, new products continuously introduced onto the market and diffused to ever wider sectors also perpetually stimulate and promote individualization.

Unfortunately, a feature of this process of individualization that is hard to manage is that the individual undergoing it does not himself recognize the process, and insofar as he is not aware of the process, insofar as he doesn't recognize individuality as individuality, the net result is an accumulation of frustrated desires. Such frustrated desires, in fact, amount to an increasing sense of alienation in the person's mind.

2.3 Self-Contradictions of Technology

In a final analysis, what these phenomena point to are self-contradictory aspects of technology. All technology, whatever its substance, can be said to be classified under one of two natures--as promoting either uniformity or multiformity.

To promote uniformity means to select and designate one optimum possibility out of many possibilities. And the promotion of uniformity should always be clearly directed toward achievement of that which is optimum. That is to say, uniformity results from the selection of that alternative which promises the optimum means to a certain objective.

There arise two problems. One is that in society, a collective body of human beings having diverse value systems, an infinite number of diverse systems with diverse objectives can exist at the point T_1, and among these systems many seem to exist in contradiction. There may exist a so-called strong system and a weak system, or a large system and a small system. In that case, the large system would negatively influence the stability of the many other systems. Any system inevitably breeds frustration in a broad sense. Such a phenomenon may manifest itself in many ways in real society, e.g., between a large enterprise and a medium or small enterprise; between two large enterprises; between enterprise and labor union; between enterprise and

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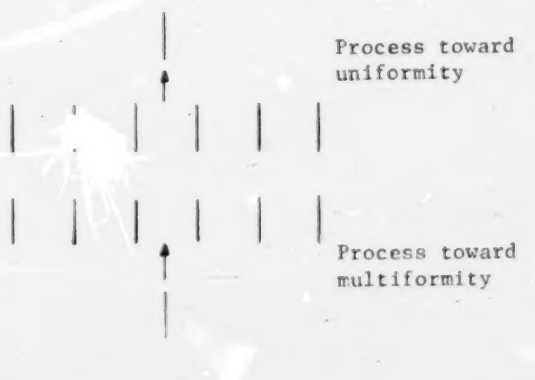
consumer; between enterprise and community resident; between government and enterprise; between consumer and labor union. Let me tentatively label such a phenomenon caused by the condition of uniformity as a "phenomenon of horizontal tension."

Let us speculate on another phenomenon contrasting with the "phenomenon of horizontal tension" in a system with a certain objective. As long as we define this system abstractively as "that means which is optimum to a certain objective," the system will not change after a passage of time from point T_1 to T_2. However, the system in question is not necessarily the same at both points in terms of the concreteness of contents in its objective and concreteness of process in its achievement of that which is optimum, for the environmental condition of the system at point T_1 will differ definitely from that at point T_2. Thus, there will be no guarantee that the objective of that system and the optimum means to materialize that objective are one and the same at points T_1 and T_2. One of the major reasons for such a change in the environmental condition may be technological development, and one of the causes of technological development may be the aforementioned phenomenon of horizontal tension observable in the process toward uniformity. In any event, I would like tentatively to name such a change a "phenomenon of vertical tension" caused by the condition of uniformity. Even if a system always has only one optimum means to achieve its objective, the optimum means at point T_1, speaking concretely, will never be the same at point T_2.

The concept of multiformity represents another way of systematizing phenomena. By promotion of multiformity is meant the addition of a number of alternatives to a situation in which only one alternative had previously been recognized, that is, promoting the coexistence of many divergent possibilities. The influence of technological achievements on the individual's consciousness clearly falls under the heading of promotion of multiformity. As new alternatives are developed by technology, new possibilities are recognized in the individual's conscious mind, and this does not by any means wipe out conscious recognition of already existing possibilities.

The so-called diversification of value systems signifies two tendencies: one, that differences in individuals' views on value are becoming larger than ever; the other, that individuals' views on value are becoming more flexible than ever. The phenomenon of multiformity concomitant with technological development will enhance the diversification of views on value in terms of those two tendencies; however, in real society, the tendency to uniformize technology becomes predominant. Especially when the "phenomenon of horizontal tension" caused by the condition of uniformity becomes prevalent, the needs of consumers or community residents will often not be fully satisfied because of some strong system, e.g., a system initiated by a large enterprise. Furthermore, the objective of such a strong system tends to become rigid, being influenced by the aforementioned "pheonmenon of vertical tension." Technology obviously turns against man, and a phenomenon of conflict between standardization and individualization can be said to be an obvious manifestation of the outcome of the conflict. There is no denying that the expansion of technology's scope will proportionately reinforce the process toward uniformity, in turn leading to deeper alienation.

The real danger is that technical engineers themselves may develop the mistaken impression that technological development is inevitably directed toward uniformity-promoting technology, an impression which unfortunately is being reinforced through the type of technological education available these days. Present-day engineering education tends to encourage would-be engineers, who have an inherent inclination towards concentrating on a relatively limited field, to further restrict their already narrow scope of studies and



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to become, in effect, "machinelike" human beings. Moreover, the environment in which the engineer finds himself after graduation only further emphasizes this tendency towards a closed-minded and thoroughgoing devotion to uniformity-enhancing technology, and this tendency is intensified in proportion to the size of the company or organization involved. The trend toward making important decisions behind closed doors is, as a consequence, being further intensified.

Under such circumstances, even the "machinelike" engineers begin to suffer from a sense of alienation toward their work. However, those engineers who have already developed into "machinelike" human beings no longer have the capacity to free themselves from their vocation.

2.4 Environmental Destruction

The phenomenon of environmental destruction caused by expanded production capacity is a case in point for the consequences of technological development solely in the direction of forward feed. Indeed, any attempt at fundamentally resolving environmental destruction must put heavy emphasis on correcting the pattern of technological development, i.e., to a pattern featuring the function of feedback. From this viewpoint, we come up with new insights into whether or not the approach we are currently taking to prevent pollution is what it should be, whether or not our conceptions of technology assessment are as they should be. For instance, are the countermeasures to pollution themselves free from the possibility of causing new pollution?

In cleaning up the air, to take a concrete case, we have opted to emphasize battery-run cars as a replacement for gasoline-burning cars. No doubt this will ameliorate air pollution as it is at present, but in the implementation might we not encounter new types of pollution? Prior to accepting such alternatives, it is actually incumbent upon us to ask for what purposes and reasons the "car" as a means of transportation is required, and whether our transportation needs cannot be fulfilled by other means. Thus we are led to a fundamental reassessment of the relation between transportation and communication.

Human beings tend to convince themselves that the path they have been following up until now is the only path available. Industrialization gives rise to pollution--this is clearly attested to by the history of the industrialized countries--but it does not follow that all types of industrialization must necessarily lead to pollution. Therefore, even though the developing countries aim to attain industrialization, this aim in itself has no fault. What would be wrong is for the developing countries to believe that their industrialization can follow no other path than that followed by countries now industrialized.

What is meant by an agreeable environment for human beings? Answering this question seems to pose no difficulty; however, one is badly mistaken if one really takes the matter lightly, for what is presented here is a question concerning value. The more diverse views on value become, the more difficult it becomes to pinpoint what is meant by an agreeable or disagreeable environment. An environment agreeable to a people (or a community resident or an individual) is not necessarily agreeable to all other peoples (or all other community residents or all other individuals); an environment recognized as agreeable at a certain point of time is not necessarily recognized as agreeable at every point in time. That is, both vertically and horizontally, the question of the perception of environmental quality is extremely difficult to solve. We must conduct research on a worldwide scale, looking objectively at the variations of perception in different conditions, the relationship between the quality of environment and the quality of life, and the relationship between the quality of environment and life and the conditions of human society.

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2.5 Worldwide Concerns

We have already seen that the scale of technology has become tremendously enlarged so that it now reaches into every corner of life in this world, and it would be reasonable to expect that man's consciousness would have developed and changed right along with this expansion of technology; but the fact remains that man lags far behind in his conscious adaptation, and when it comes to the social system, the lag is even more conspicuous. For example, in the relation between actual business activities of multinational enterprises and the international monetary framework supporting these activities, the latter is obviously lagging behind the times. Moreover, there has been little progress in closing this gap.

For multinational enterprises today, boundaries often function negatively. Many features of technological innovation pointing toward postindustrial society share the same objective, that is, to develop a predominant, widespread influence. When such an influence arises in an advanced nation, it is not unusual to witness the penetration of this influence into all parts of the world, including emerging nations. Today, technological development is, on one hand, heading in a direction where the value of a boundary is less emphasized. However, on the other hand, it is not to be denied that the existence of boundaries becomes increasingly important to some emerging nations influenced by technological innovation, at a certain stage in the development of their technology, economy, and industry. For instance, in the case of emerging nations attempting to make their infant industry viable at a normal pace, or in those nations where trade appears to be in the state of infancy, boundaries are undeniable matters of fact.

In fine, the world at present has two faces: it is proceeding in a direction where the value of a boundary gradually becomes less important, while for some emerging nations it becomes an absolute must to take the opposite direction. This two-facedness well reveals the fact that every order in the world must have flexibility suited to its needs. But not all orders in this world are always flexible. We can see that the order of international currencies largely lacks flexibility.

From a global viewpoint, what is needed to promote a reassessment of technology and new efforts in feedback techniques? The pioneering studies of the Club of Rome undoubtedly represent one promising attempt to promote feedback technology, and here we would like to suggest another meaningful area for emphasis.

New criteria should be developed for human activities so that the finiteness of the earth and the ranking of each country in terms of human activity may be more clearly recognized. Up until now, the most universal method for measuring human activity has been to represent the results of all human activity in monetary units, such as gross national product and national income. Such criteria fail to throw light on the finiteness of the earth. It is proposed for this reason that all human activity be converted, not into monetary units, but into consumption rates of specific resources. For instance, human activity may be measured by the rate of energy consumption to develop an index of gross national energy consumption. In the same way, indices of gross national sulfur consumption or gross national oxygen consumption may be established. The indices could subsequently be converted to show the degree of resource consumption per unit area. Although national income is frequently converted into per capita income, our indices could more profitably be translated into degrees of concentration per unit area.

An international organ such as the United Nations might take the initiative in preparing these new indices annually for each country throughout the world and in drawing up something like a weather chart for energy and each of the other specific resources found on the earth. The "weather charts" would indicate what countries are under "low atmospheric pressure" and what countries are under "high atmospheric pressure" with regard to the consumption volume of any specific resource. Any country

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deemed to deserve a "warning signal" on the basis of the indices would be singled out for a survey of the industrial structure, etc., and would receive recommendations on industrial and economic policies. Such indices might also be applied by an individual nation to its economic development by region. At any rate, it is necessary to develop new criteria enabling each nation to gain a clearer recognition of its position in relation to satellite Earth, and Japan would be well advised to take the initiative in adopting such a set of indices.

When we become familiar with such indices, we are prone to speculate on the situation in which a human being, whose sphere of activity is always confined to this finite globe, must stand both as an individual and as a public being. As this way of thinking becomes common, we may be able to reexamine the ways in which technological development should move in the direction of feedback, touched upon at the very beginning of this paper. When we assess technology from the above-described point of view, we may be able to arrive at results altogether different from those obtained from present-day technology assessments. Such a problem as the dehumanizing aspects of technology would, thus, dissolve spontaneously.

2.6 Common Needs and Individual Needs

In order to cope with the standardization and rigidity of technology brought about by systematization emphasizing the merits of uniformity, we must try to develop multiformity-producing technology, and the software fields of science and technology will aid in this. Nevertheless, although it is indeed necessary to narrow the gulf between needs and technology, it should be understood that it is not to our advantage to denounce en masse all technological uniformity and rigidity. It should not be overlooked that these features are a requirement in some cases.

In more specific terms, needs, as found in the needs ⟷ functions ⟷ technology relationship, can be said to include common needs and individual needs, and some common needs will remain unchanged however far the process of value diversification progresses. For this reason, functions should also comprise both common and selective functions corresponding to the relation between common and individual needs. For common needs, one-dimensional systems will prove not merely satisfactory but, rather, definitely advantageous. Individual needs, in contrast, should be dealt with by multidimensional systems.

The following questions need clarification at this stage: First, in concrete terms, what are common needs, what are individual needs, and where is the boundary for the distinction between them? Second, is the difference between unidimensional and multidimensional systems simply a quantitative difference, wherein the former are represented by only one system and the latter by a number of systems?

Let us consider the first question. Generally speaking, the need for transportation, communication, energy, and other public services may be regarded as a common need. But this generalization requires a little further clarification. Taking transportation as an example, we see that means of transportation are required because people need to travel. However, traveling comprises at least two different types of need. One type is represented by commuting to offices and schools and is for all intents and purposes a universal traveling need. In this case, the transportation means corresponding to the need can properly be understood to be public mass transportation facilities which reliably transport passengers from one location to another at given times. For meeting this type of need, a fully unified system with a fixed operation schedule is the optimum alternative.

Apart from commuting needs, however, people also feel a different sort of travel need represented by volitional and unscheduled traveling by individuals. The transportation means to fulfill this type of need can quite profitably be automobiles, bicycles, and other vehicles of the "door-to-door" type rather than public

transportation facilities which are operated according to fixed time schedules, along set routes and to designated stops.

Though the bus and private car may drive along the very same road, and though they both are means of transport, it is clear that the bus meets a common or universal sort of travel need while the car satisfies an individualistic travel need. Public transportation facilities are being systematized in a way to make optimum use of their distinct travel function, but when it comes to private cars, partly because they too use the public roadways, there has been inadequate study and much misunderstanding of how they can fit into their own system.

In the same way as transportation needs, communication and energy needs may be considered to be common needs from a macroscopic viewpoint, but they too require more elaborate consideration when one views them more closely. As a general rule, a differentiation between common and individual needs should always be carefully made.

Moving now to the second question concerning the basis for distinguishing unidimensional and multidimensional systems, it should be clear from the foregoing that a multidimensional system, where several systems are in simultaneous operation, does represent a quantitative change. But this is not the only difference. What is important is whether or not the user has a chance to make selections. A one-dimensional system does not permit the user this luxury, while a multidimensional system does. In this sense, the former may be called an administered system and the latter a participatory system.

We should find cause for reflection in the fact that existing social systems are almost without exception administered systems, while participatory systems have been essentially ignored. In communications, for example, only now is the need for participatory systems on a community basis being recognized. Particularly urgent in this respect is the need for better means of communication not just for the geographical community but also for the functional community--that is, for that set of people united by functions--although admittedly the functional community may often be coincident with the geographical community.

It may be added in this connection that urban traffic systems, which have recently been attracting much attention and discussion from different angles, are regrettably being treated not as participatory systems but as administered systems controlled from the functional standpoint of facilitating the traffic flow of motor vehicles. This is clearly a case of trying to find a solution before the problem is understood. At any rate, a transport system which is designed for private cars and the individualistic travel needs they embody should be not an administered system but a participatory one. The different types of urban traffic systems now evoking so much discussion should be thoroughly reviewed from this particular standpoint.

If participatory systems are properly developed side by side with administered systems for all social systems, the rigidity and standardization resulting from the tremendous expansion of technology will be moderated and man's sense of alienation will be modified. Further, it will be possible to respond to the need for greater individualization.

3. Countermeasures

3.1 Changing Our Ways of Thinking

At the beginning of this essay we noted the need for a new understanding of the way forward feed and feedback affect the character of technological innovation. Needless to say, in gaining our new understanding we must examine all phases of the topic.

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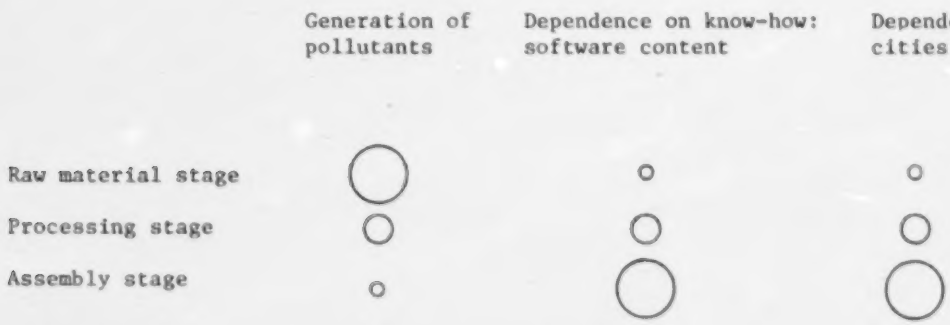
Through such an analysis will we not discover that the industrial structure of Japan is now in need of very fundamental reform? Up until today, Japan has relied on petroleum imported from the oil-producing countries as an energy resource for expanding industrial activities and for promoting export of finished products. As the result of such a policy, however, not only have her oil imports caused worldwide repercussions because of their magnitude, but also her industrial expansion has on its part made her land and skies into a global capital of pollution, which moreover is heavily concentrated on her Pacific Ocean side. The economic power of Japan has become so great that a number of countries around the world are concerned about the possibility of an "economic invasion," and this situation has no doubt further aggravated the current instability in the international monetary situation.

Under the circumstances, it is indeed a serious problem if technological innovation acts only to accelerate current trends. Should we today continue only to emphasize bigger, more comprehensive, broader-reaching technological developments? Can we afford to delay in assessing technology from the global viewpoint? In other words, have we not reached a stage where radical restructuring is necessary in industry, trade, technological development, and all other fields?

As an attempt to clarify the situation, we recommend a "horizontal" analysis of industry in contrast with a "vertical" analysis which follows the flow of individual goods from raw material to finished product. Our horizontal analysis focuses, rather, on such factors as raw materials, processing, and assembly.



Several comments follow from our horizontal analysis. First, the existing pattern of Japan's industrial development, where industries processing raw materials are concentrated in coastal areas near large cities, is clearly an illogical pattern. It follows that it would be beneficial to change the industrial structure so that companies near large cities would become processing- and assembly-type operations. In other words, what is now necessary is not heavy and chemical industry development, the keynote of past industrial policy, but a rational systematization of the industrial structure. Such a shift would also be in line with the general trend among industrialized nations of the world, and in this respect Japan's past performance in structural change has been far from satisfactory.

In the course of such a change, industries featuring the processing of raw materials and semi-finished products should, as a general rule, be transferred to developing countries, and this transfer must be carried out under the condition that the operations are "de-polluted," lest the end result be merely the export of pollution.* Some may contend that it is unnecessary to transfer raw material and processing industries after de-pollution. In answering such a contention one should keep in mind that both transfer and de-pollution are, for differing reasons, requisite goals.

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* As Mansholt puts it, the processes must incorporate "C & R," that is, cleaning and recycling.

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To some degree Japan will have to retain industries processing new materials, and even in this case it is absolutely necessary to free the production processes from generating pollutants. It might prove educational to classify industries in three categories: polluting industries, nonpolluting industries, and pollution-reducing industries. In the course of industrial modification, it will of course be necessary to guard against irrational policies in which nonpolluting industries are fostered by dint of further expansion of polluting industries. To preclude any such possibility, it is necessary to take inter-industry structural relations into thorough consideration.

It may be noted in this connection that Japan's traditional pattern of economic relations with other countries, characterized by her import of raw materials, export of processed goods, export of technology, and acceptance of foreign students for study, has given rise to a very conspicuous differentiation between those countries which Japan influences and those by which Japan is influenced. Moreover, this same pattern is being progressively intensified year after year. In contrast, the foreign relations of other industrialized countries tend to be characterized by closer and stronger mutual dependence. This particular feature of Japan's international economic relations thus needs to be seriously reviewed in working out future policies.

In summary, it is necessary for the Japanese fundamentally to change their approach to systematization if Japan's industrial structure is to meet the need for further systematization and process conversion to assembly-type industries.

3.2 Assessment as Applied to Welfare

It may be assumed that "systems" industries are to be evaluated on the basis of the software in their possession. The reason why such industries are predominantly urban is that cities function as reservoirs of knowledge, and there are two important reasons for this. One is that a city functions well as a control center for the production and storage of great volumes of information. The second is that the city serves as a container for a multitude of needs. Others have given careful attention to the former function of the city, but here we would like to bring out the importance of the latter.

Since a city is on one level an assemblage of a great number of individuals, and since these individuals maintain different viewpoints and value systems, it is obvious that a great many needs come to reside in the city. However, many such needs have yet to be fulfilled, and in fact, among these are many hard-to-identify needs that the city's citizens do not consciously recognize. Even though they are not perceived needs, they still act to arouse an indefinite sort of unease, and this unease goes without treatment because its source has not been fathomed.

Traditional systems have almost completely failed to bring to light such latent and subconscious needs, to say nothing of the fact that these needs have yet to be identified even as "common" or "individualized" needs. What actually may be happening is that the individual's sense of participation is being adversely affected by past attempts to modify systems, attempts which have always been characterized by the reinforcement of methods of control. Naturally, the last thing that people have expected in the design of administered systems was a clear distinction between administered and participatory systems. For the future, however, how should we go about ensuring proper design and development of systems?

A disturbing fact is that people have gone right ahead in designing and implementing programs for the sake of "welfare" even without the necessary basic understanding, and because such misguided approaches are advertised under the name of welfare, an atmosphere arises that tends to compel acceptance of the programs with an air of gratitude even though they may actually be ineffectual. One result is that

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high-flown phrases such as "first priority to people," "livelihood comes first," and "welfare of the nation" are now freely bandied about to conceal the real poverty of the programs.

Although the development of software into "soft science" and "soft technology" truly deserves recognition as creating a science and technology capable of promoting human welfare and social development, if the approach to further development and application is misguided, the result will be an accelerated intensification of social rigidity and anti-human systems. In this respect, a new assessment is needed of such proposed systems as giving each citizen a serial registration nunber, in light of the growing criticism and repulsion felt by the people.

3.3 The Importance of Education

The most important ingredient for developing fundamentally new conceptions of technology and for qualitatively changing technology into technology for welfare both in name and reality is the human being. While we must admit that technical engineers are the men who can specifically bring about the needed changes, we should go on to ask whether persons other than engineers are not part of the present state of affairs and therefore capable of playing a role in the solution of problems.

It is felt that the concepts of technology and the technical engineer should not be taken too narrowly at this juncture; rather, a wide range of people including the so-called "organization man" should be part of our conceptions. Not a few people among office employees, administrators, and bank personnel, for example, may be called "engineers" in the broader sense of the term. Without the active participation of this wide category of engineers, tentatively called "organization people," without redressing the lack of flexibility and "organization first" attitudes so characteristic of organization people in modern Japan, it will be impossible to open their eyes to such concepts as the feedback form of technology introduced above.

As we review education from this veiwpoint, it is evident that education today is in substance education for an industrial society, and this phenomenon is not limited to Japan alone. Although industrialized societies are already stepping into the post-industrial age, educational systems are not yet ready to cope with the accompanying changes. Education, by nature, should be man's most futuristic activity in that it is dedicated to fostering understanding of past changes and changes to come, and it is to be regretted that the educational systems we see today display features that are outmoded and backward in nature.

It was an event of great significance in Japan's history when the Meiji Government succeeded in fundamentally reforming the concept of the "state" in the minds of schoolchildren. To accomplish this change, the Government introduced compulsory education for the purpose of fostering conditions suited to the transition from an agricultural to an industrial society. Such a transition was at the same time a change from a society supported by small quantity, low productivity technology into a society organized according to the technology of mass production; it was a conversion from small markets to the mass market. Economic changes, moreover, coincided with changes in the political and social systems, which were transformed from the feudalistic Shogunate clan system into a centralized administrative system.

At that time, reforming the consciousness of the people was not easy. As the proverb says, "The child is the father of the man," and national consciousness, once solidified, does not respond spontaneously to changed social conditions. Nevertheless, the educational reform undertaken by the Meiji Government was successful in reshaping the people's consciousness.

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The full significance of the Meiji Government's initial steps in educating schoolchildren and elevating their as yet undeveloped level of consciousness to a national consciousness of the Japanese people became evident only in later years, as these individuals who had been so thoroughly imbued with a national consciousness came to occupy key positions in society from the latter half of the Meiji era, when Japan really began developing into an industrial society, to the time of World War I. Another important effect was that companies could move smoothly into systems of mass production, an essential requirement for many industries, as education had standardized the small markets into a single market covering the whole country.

For such reasons, Japan, which was more than a hundred years behind major countries in Europe and America in respect to industrialization, succeeded in catching up and even outstripping many countries in the hundred-year interval from the Meiji Restoration to today. It is beyond any doubt that the key to this success was the reformation of the consciousness of the people, a prerequisite for supporting an industrial society.

Today, however, Japan is entering upon a period of transition from the industrial society to the postinudstrial or "information" society. The existing educational systems have yet to respond and try to prepare new understanding and new ideas adequate for the coming society. Two characteristic features of the information society can be pinpointed, as viewed from the standpoint of the technology supporting that society: first, the society will broaden rapidly toward an international or world society; second, the society will progressively promote more individualization. These changes are in line with the conceptual shift from forward feed to feedback technology as outlined above. To rephrase these essential changes, the first represents "internationalization of conceptions" while the second represents "the individual's sense of participation in planning."

If one basic aim of education is to foster consciousness fitting this position, then the education of today is far from the projected goal. Society at this stage of societal development is in need of men of ordinary talent who doggedly pursue creative thinking for themselves, rather than men of exceptional talent who quickly grasp new ideas but do not take a hand in their formation. During periods of rapid social change, the most important thing for any individual is to perceive for himself the nature of the change--its causes and consequences--but present-day education is given to teaching techniques for minimizing friction in dealing with the change as best one may.

When men of talent educated in this way start their business careers, the natural consequence is that they are concerned with nothing more than the interest of the organizations to which they belong. This means that these individuals can become "honor members" within their own organizations, but they are not apt to gain respect among those who are outside of the organizations. This is true of companies as well as the state. A pattern like this is none other than forward-feed thinking, and unless such a mode of thinking is discarded, any attempt at solving the problems confronting society, whether they be environmental problems or international monetary problems, will in the end adversely affect the interests of the society and the parties involved, however cleverly the impending problems might be evaded.

3.4 Some Characteristics of Japanese Society

It is necessary to consider how changes in conception will be related to the characteristic features of Japanese society at this turning point in time. While "being Japanese" and internationalization at first glance appear to be contradictory concepts, being Japanese and individualization appear, on the contrary, to go hand in hand. But again, learning to think in terms of a global level of feedback also seems, on the surface, to be a trait alien to the Japanese character. These are superficial statements, and we need to delve into the subject in greater detail.

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It has often been asserted that from ancient times Japan has been an extremely and perhaps uniquely homogeneous society, and for a sharp contrast European society has generally been cited. Here we should recall that Japanese society comprises the descendants of an agricultural people while European society is, broadly speaking, made up of the offspring of many nomadic races. Both nomadic races and agricultural races--meaning here the ancient Japanese--unquestionably demonstrate gregarious characteristics, but in spite of this point of similarity the two contrasting modes of living lead to many basic differences.

An agricultural race, because it settles down rather permanently in one site suited to agriculture, develops the ability to adapt to various changes of the environment beginning with the annual change of the four seasons. As a consequence, little sense of autonomy in respect to the surrounding environment is developed. A nomadic race, on the other hand, packs up and leaves its homestead for a nomadic tour whenever the surrounding environmental conditions threaten to disrupt the accustomed life, for this type of race keeps constantly aware of the conditions required for its own existence. Thus, the nomadic race develops gradually into a race poorly adapted to changing to fit the environment but having a strong sense of independence.

The Japanese and the European peoples may be cited as representative examples of these two types of race with their distinct contrasting features. With respect to individual members of the race, in a gregarious farming race like the Japanese, the individual learns always to recognize himself in terms of a mirror image which reflects the behavior and reactions of other members of the same race. This is fittingly expressed in the Japanese proverb "One man's fault is another man's lesson." As a contrast, the individual member of the gregarious, European nomadic race does not need to see his own behavior reflected in the community mirror to recognize himself. Rather, he tends to develop an intense feeling that he is independent of others even within his community.

This line of thinking follows consistently from the individual right on up to larger entities and finally to the state when it comes to be organized. In Japan's case, the overall society has retained an extremely homogeneous nature that, in degree, may be unique in the world. With a homogeneous society, a high rate of inflow of alien factors from the external world prevails whenever a "negative gap" arises between the homogeneous society and its exterior surroundings, i.e., whenever the homogeneous society finds itself lagging in respect to social, cultural, or technical development. But an influx of unassimilated heterogeneous factors will call forth a "rejection reaction" from within the homogeneous society, for the society cannot admit heterogeneous factors into a homogeneous environment. Rather than driving out the alien elements, however, the reaction of refusal becomes manifest in an eager digestion and assimilation of the alien elements.

If this type of reaction may be called a "dynamic" rejection reaction, the reaction to alien elements characteristic of the European races may be referred to as a "static" rejection reaction. In other words, the European races feel only a small incentive to take in alien elements, digest them, and fully assimilate them. This does not mean that all newly entering heterogeneous factors must immediately be rejected, but rather that when the alien element does not fit smoothly into the heterogeneous surrounding it is either rejected outright or thrown back after an initial trial.

In the homogeneous society the reaction to foreign elements is thus a more dynamic response, but it must be remembered that this dynamism prevails only when the society perceives a negative gap between itself and the outer world, not when the opposite circumstances hold true. To rephrase this, the probability that a foreign element will flow into and be assimilated by the homogeneous society is greatest when that society is lagging behind other societies and least when it is not, for in the latter situation the possibility of disturbing factors is smaller.

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It is well known that the Japanese are very alert in the introduction of advanced technology from industrialized countries of Europe and America, displaying a marked dynamism in absorbing and assimilating the incoming technology. At the same time, it is also pointed out that Japan tends to show a certain lack of consideration toward aiding the developing countries of Asia, in spite of her status as the most highly developed nation in Asia. It is our postulation that one of the reasons for this feature of Japan derives from the foregoing character trait of the country.

This pattern of thinking which has been gradually reinforced through Japan's long history is a passive pattern, one that pursues comprehension through simultaneous sensory intake and recognition of assorted external stimuli. We call it a "totality thinking pattern" as it follows the holistic approach of grasping the whole and beyond the parts. The thought pattern common among Europeans is, rather, a "linear" pattern, if we are to make a contrast, for it actively grasps a problem as a target, dissects it logically, and pursues a careful, step-by-step approach to the target.

Needless to say, science--and, above all, the natural sciences, like the technology which grew out of them--has always been characterized by logical consistency, and it is only natural that science and technology arose first in a European and American climate (for, after all, the Americans were originally Europeans who crossed the sea). In other words, science and technology are the products of linear thinking.

Ever since the Meiji era, Japan has been importing, absorbing, and assimilating the products of this fundamentally heterogeneous thinking pattern, that is, science and technology, from countries in Europe and America. In this respect, if we look further back into Japan's history, we find that the process of assimilating alien elements actually began in ancient times and not just in the Meiji era. Over the course of this repeated process, the physical constitution of Japan has naturally undergone qualitative change, but the homogeneity has been retained. It was probably under the influence of qualitative changes that took place under the impact of Confucianism imported from the Chinese continent that the easygoing Japanese people of the Manyo era (ca. A.D. 700) came to have a rather confined ethical view. Nevertheless, the process of homogenization was always at work.

Since the Meiji era, however, it appears that the introduction and assimilation of Western technological civilization has been causing too rapid a qualitative change. For this reason, many of the incoming products have been only poorly assimilated, and the Japanese people, while still holding common feelings of fraternity in the very depth of their hearts, have come to develop a kind of enclosed or "glassed-in" society with a high degree of rigidity as well as a consciousness incidental to such a society. There is no denying that this sort of national setting has developed into a set of fetters on present-day society.

In view of the inherent nature of the Japanese people to respond delicately to changes in circumstance, it can be expected that they will awaken before many other peoples do to the need for transforming society from an industrial into a postindustrial or an information society, and to the necessity of restructuring technology so that it incorporates feedback on a worldwide level. But why is it that the Japanese have yet to awaken to the present need?

One reason is that the thinking pattern of the Japanese, which even now retains the pattern of a totality thought approach, is by its nature extremely passive. A passive thinking pattern creates a tendency toward very quick response to change after the change has been recognized but very slow reaction until the point is reached where the new need is quite obvious. Another reason is probably that the cramped and glassed-in posture of the national consciousness has dampened the acuity of totality thought patterns. If that is the case, the educational system cannot be deemed to have fulfilled its responsibilities.

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While it cannot be denied that Japanese education since the Meiji era has been appropriate to the formation of an industrial society, it should simultaneously be recognized that this education is now a serious obstacle to Japan's transformation into a postindustrial society. But be this as it may, what requires special emphasis is a clear distinction between thinking "patterns" and thinking "processes." While thought in a pattern of totalities will remain a Japanese characteristic basically unchanged in the coming years, this does not mean that the process of thinking must be accompanied by leaps in argument and gaps in theoretical coherence.

Japan is entering upon an age in which a society composed entirely of Japanese people in a unique homogeneous setting can no longer be maintained. Whether the Japanese people are ready for it or not, they will obviously have to develop closer relations with other societies and peoples, both as individuals and collectively as a nation. Under the circumstances, it will become increasingly necessary for the Japanese to accept heterogeneous elements in their own right and to develop a set of techniques and procedures for communication interchange including heterogeneous elements. More specifically, it will be necessary to regard this task as an objective for technology, to design appropriate systems and to develop fully flexible software for operating the systems.

This kind of software is what we have termed "social" software, and this is the type now urgently required. Its development is not a question of the thought pattern but of the process of thinking. A great contribution to the new society can now be made by developing new thinking processes on the basis of the typically Japanese thought pattern.

One of the symptoms of the excessively fast introduction and assimilation of Western technological civilization since the Meiji era is to be found in the attitude of the Japanese people towards technology. This attitude is characterized by a still persistent inclination to recognize innovation more as a "stranger" than as a "friend." Although all technology shows the same outside appearance to the casual observer, Japan's technology is different in nature from that in the industrialized countries of Europe and America, for technology in the West has been autogenously produced within the societies while that in Japan has been exclusively imported from abroad. The technology in the former case may be called endogenous technology, while that in the latter case may be called exogenous technology. Endogenous technology is the friend while exogenous technology is the stranger.

Although no friction arises so long as the progress of technological innovation appears to bring good tidings in the eyes of the people, opinions will immediately be split between appreciation and deprecation once technology starts generating adverse affects upon the society. Still, no basis for a thorough denial of technology will present itself, however seriously it may be considered a villain in any particular instance, so long as it is perceived by and large as a "friend." If it were admitted that the evils of technology are a problem that must somehow be coped with as such, the Japanese would come out very straightforwardly with the attitude that countermeasures are necessary; but if technological innovation continues to be regarded as an alien presence, the people may unhesitatingly assume an attitude completely denying technology itself and may try to expel it from their society. Such a mental climate is still widespread in present-day Japan, and it has created an atmosphere where those who simply deny technology itself can cloak themselves as messengers of justice and righteousness.

It may be noted in this connection that Japan, which has thus far brought itself up on exogenous technology, did not require a groundwork in the basic sciences which have served as the support for technology. One result is that it is nothing exceptional, to this day, for the Japanese to make light of research activities in the pure sciences. Except for a minor group of studies including mathematics and theoretical physics, a free influx of foreign methods and techniques has been permitted with hardly any modification.

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As mentioned above, the Japanese have until now perceived the existence of a negative gap between Japan and the advanced industrialized countries, and this sense of a lag has effectively created a situation facilitating an easy influx of advanced techniques. Simultaneously, Japanese society has protected the features of its homogeneity as a society through what we termed a dynamic rejection reaction, that is, prompt digestion and assimilation of the technology flowing in from the outside. The impact of this dynamic mechanism, however, will diminish in proportion to the narrowing of the gap between the Japanese technology and external technology. The reason is that a society run by exogenous technology which has merely been imported is deficient in the elements that could lead to a "self-motive power" at work within the society.

As we consider the future of Japan from this viewpoint, we come to the conclusion that Japan should do everything within her power to cultivate autogenous motive power at this stage in her development, and such a task will require, as a fundamental prerequisite for fulfillment, the allocation of a greater volume of resources for research in the basic sciences. At the same time, it will be Japan's responsibility as an advanced nation actively to contribute to the world in basic science research over the coming years.

For the purpose of coordinating such scientific research with that kind of technological innovation which will truly promote social development, the Japanese must work to establish closer relations between the social sciences and the humanities in a manner that facilitates coherent and profound assessment of the interrelations of science and technology with the economy and the society. Without this foundation, even the most energetic application of technology assessment will prove meaningless. If the right approach is followed from the beginning, there is no doubt but that new organizations and new systems adequate to the goals will arise and that, at the same time, a sense of social responsibility will be awakened in the minds of scientists and engineers. After such development starts in earnest, the need will become clear for science and technology which can initiate new societal development over a wide range of areas which have yet to be explored, and it goes without saying that the tools we must use to explore new fields in the coming years are those of "soft science" and "soft technology."

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Part II

DIRECTION AND ANALYSIS OF TECHNOLOGY TRANSFER BETWEEN JAPAN AND OTHER ASIAN NATIONS

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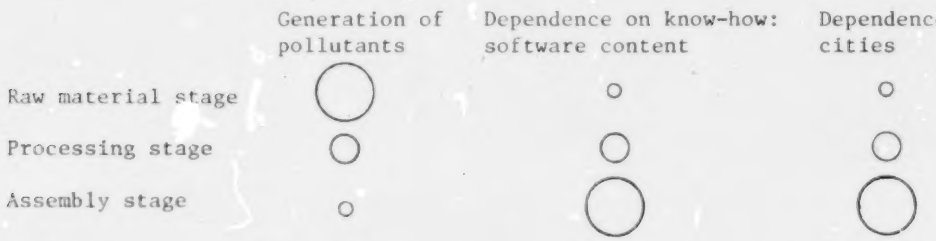
1. Two Problems Stemming from a Change in Industrial Structure

As I pointed out in section 3.1 of part I, "The Objectives and Functions of Technological Innovation," in considering the direction of industry in the future, it would be better for us to employ, in place of the conventional method of "vertical" classification which makes the flow from raw material to product the axis, the method of "horizontal" classification which divides the production stage into three stages--raw material, processing, and assembly.

Please refer to the following chart, shown in the aforementioned section 3.1, for this chart marks the starting point of my argument.



After presenting this chart, I stated: "Several comments follow from our horizontal analysis. First, the existing pattern of Japan's industrial development, where industries processing raw materials are concentrated in coastal areas near large cities, is clearly an illogical pattern. It follows that it would be beneficial to change the industrial structure so that companies near large cities would become processing- and assembly-type operations. In other words, what is now necessary is not heavy and chemical industry development, the keynote of past industrial policy, but a rational systematization of the industrial structure. Such a shift would also be in line with the general trend among industrialized nations of the world, and in this respect Japan's past performance in structural change has been far from satisfactory."

From this statement the following two points are to be highlighted as a matter of course. The first point is that industry in the raw material and processing stages will gradually undergo technology transfer to those developing nations desiring to produce from raw materials and industrialize their raw materials. (We should not give attention only to developing nations, although we would be bound to include them.)

The second point is that Japan should proceed toward the stage pf assembly. In concrete terms, what does this mean? Put in other words, a shift to this stage signifies a shift in industrial structure to a "knowledge intensive" structure. And what does that mean? How does the avenue that Japan has hitherto followed differ from what would follow that shift? Furthermore, in case of such a shift, what kinds of problems could be anticipated?

2. Reexamination of Relationships in the International Division of Labor and Confrontation with the Energy Crisis

2.1 Reexamination of Relationships in the International Division of Labor

When we consider the case of technology transfer from Japan to developing nations, which I have already mentioned in section 1, we must first of all examine the relationships in the international division of labor--both present and future.

It is well known to us that the world before World War II had vertical international division of labor relationships between the industrialized nations and nations supplying raw materials. In postwar times, these vertical relationships changed

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drastically into horizontal relationships with an increasing compartmentalization of industrialized nations, as seen in the cases of the European Community and the Organization for Economic Cooperation and Development. This is also a well known fact. It is also known to the world that Japan's economic growth has been achieved against a background of change in international division of labor relationships. For Japan, whose natural resources are scarce, it was imperative that industrialization be promoted and that she exchange industrial products with other industrialized nations.

However, from the second half of the 1960s to the 1970s, international division of labor relationships began to show signs of a shift back to vertical relationships. These might be called relationships between highly industrialized nations and rudimentarily industrialized nations. The nations supplying raw materials would not stay put in the stage of primary-product suppliers. They would naturally move toward industrialization. However, as we can see in the term "developing nation," their industrialization is still in progress, and the process, after all, is not easy to undergo. Therefore, in order to establish a new international division of labor relationship--let me tentatively call this a "neo-vertical" relationship--it is quite obvious that there must be a positive willingness for technology transfer on the part of industrialized nations. Especially in the case of Japan is this problem a vital one, for she is in many senses an isolated industrialized nation in Asia. The implication of the term "isolated industrialized nation" is quite significant. For clarification, let us look at the position of Japan in Asia from the standpoint of energy.

2.2 Japan, a Nation Where the Line of Discontinuity in Energy Consumption Is Extremely Evident

Please refer to tables 1 and 2, below.

Table 1. Energy Consumption Density by National Land Area

Order	Country	Consumption Density
1	Belgium	1,777
2	Netherlands	1,469
3	Dominican Republic	1,292
4	West Germany	1,190
5	United Kingdom	1,172
6	Puerto Rico	950
7	East Germany	899
8	Japan	782
9	Czechoslovakia	690
10	Denmark	584
11	Switzerland	480
12	Qatar	448
13	Italy	429
14	Poland	396
15	Taiwan	335
16	Hungary	320
17	France	300
18	Israel	294
19	Austria	263
20	Bulgaria	250
21	United States of America	234
22	Romania	198
23	Lebanon	175
24	Eire	123
25	Sweden	102

Unit: t/km^2. year
Based on figures taken from the United Nations Statistical Yearbook, 1971.

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Table 2. Energy Consumption Density by Habitable Area

Order	Country	Consumption Density
1	Japan	4,319
2	Belgium	3,161
3	Netherlands	2,923
4	West Germany	2,110
5	Switzerland	1,687
6	East Germany	1,512
7	United Kingdom	1,463
8	Sweden	1,250
9	Czechoslovakia	1,237
10	South Korea	857
11	Denmark	676
12	Poland	666
13	Italy	634
14	Finland	590
15	Austria	561
16	France	523
17	United States of America	503
18	Israel	493
19	Canada	288
20	Malaysia	170
21	Soviet Union	164
22	South Africa	59
23	New Zealand	53
24	Mexico	50
25	Argentina	22
26	Australia	13

Unit: t/km^2. year
Based on figures taken from the United Nations Statistical Yearbook, 1971.

In looking at these tables we can easily detect the fact that Japan's energy consumption density is extremely high (especially evident in table 2) and that she is alone in this in Asia. If speaking only of energy consumption density, both Belgium and the Netherlands rank extremely high (as seen especially in table 1). However, what comes obvious, if comparisons are made, is Japan's isolation. That is to say, in the case of Europe, Belgium and the Netherlands form the summit of a mountain while other nations with lower densities cascade around them; they resemble a gently sloping mountain having the Mediterranean Sea beyond its slopes and, further, adjoining the Sea, developing nations in Africa. A similar picture can be seen in the case of North and South America. The United States is a notable industrialized nation, but its energy consumption density is relatively low. Canada, Mexico, and Argentina, showing still lower densities, are around her.

Contrarily, the case of Asia presents an altogether different picture. Japan alone towers high, and around her is a complete line of discontinuity. We should not lightly draw conclusions from the existence of this line of discontinuity; however, I surmise that this signifies a perilous situation likely to give rise to abnormal meteorological phenomena. I will describe my points of argument in the next section. In any event, however, this line of discontinuity ought to be made to disappear from Asia, and in order to achieve this task Japan will have to curtail her energy consumption while other Asian nations increase theirs. This, in brief, makes imperative the reexamination of relationships in the international division of labor in Asia.

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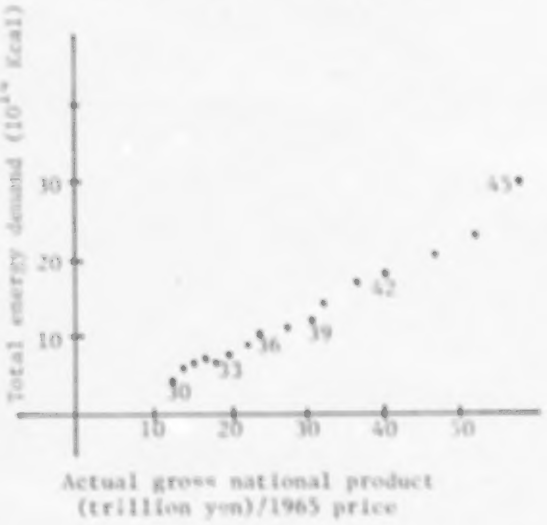
2.3 Is There a Limit for Energy Consumption?

Today, energy consumption in the world has doubled in about a decade; however, Japan shows such a high rate of increase that her energy consumption has doubled in about five years. It becomes evident in looking at graphs 1 and 2 that this high energy consumption has a close bearing upon her increase in GNP.

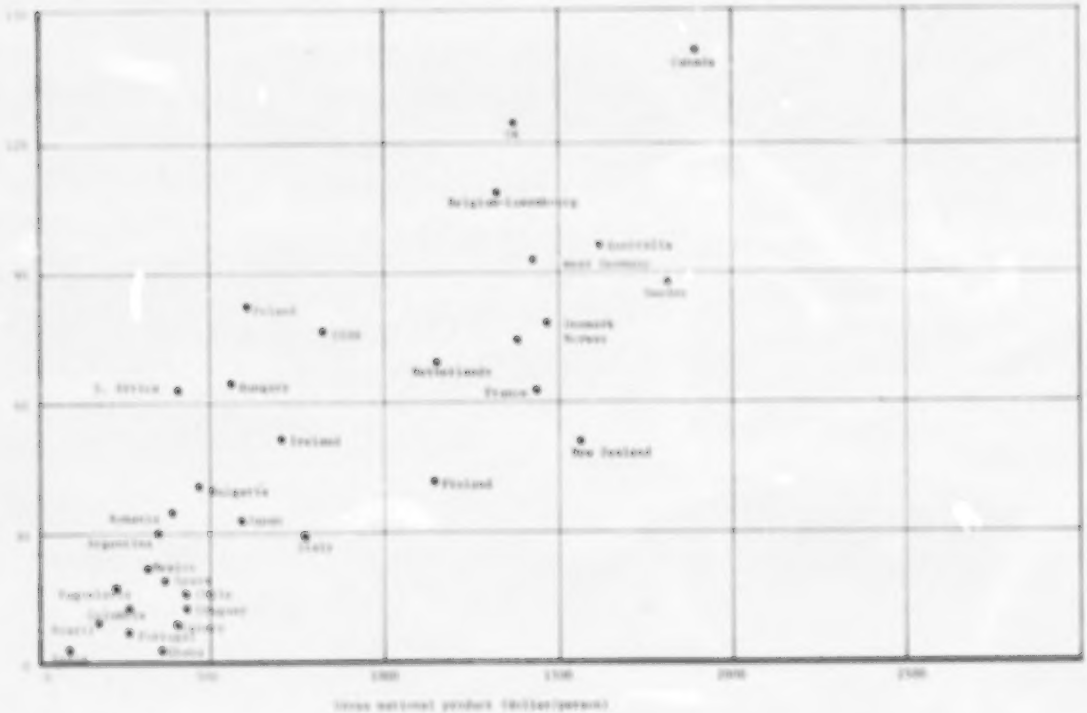
By the way, it should be noted here that various abnormal meteorological phenomena have been reported with increasing frequency from the 1960s on. While this does not mean that there is a causal relationship between Japan's high economic growth, made possible by an increase in energy consumption, and the increase in abnormal meteorological phenomena, neither is there proof that the two are totally unrelated. It seems worthwhile to raise questions about the fact that the two have taken place in parallel, in terms of time.

Graph 1.
GNP and Energy Consumption



Actual gross national product
(trillion yen)/1965 price

Graph 2. GNP and Energy Consumption of Major Nations



All natural phenomena on the earth can be said to be caused by solar energy. Figure 1 is a macroscopic picture showing the circulation of energy. As shown in this figure, only 0.2 percent of solar energy is converted into energy causing waves and winds and becoming the source of meteorology. (Hereafter I will refer to this as

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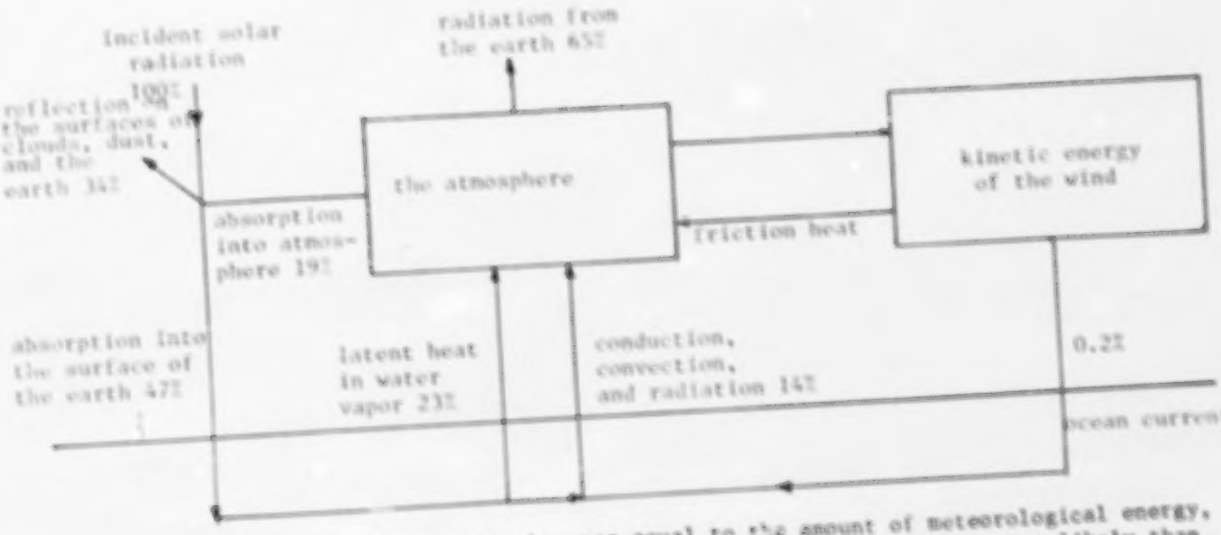
meteorological energy.) This meteorological energy, though a small percentage of the whole of the sun's energy, is by no means small as compared to the energy man consumes at present. As of 1970, man consumed energy amounting to approximately five billion tons a year if converted into oil. This amount is equivalent to about 1/30000 of the total energy falling onto the earth from the sun, and is 1/60 of the aforementioned meteorological energy. This gives us a clear picture of how vast solar energy is; however, it also teaches the lesson that man cannot be careless in his consumption of energy. For if man's energy consumption continues at the present rate, doubling in a period of ten years, it will rise to the level of meteorological energy in sixty years.

Figure 1. An Illustration of Energy Circulation


Incident solar radiation 100%
radiation from the earth 65%
reflection from the surfaces of clouds, dust, and the earth 34%
the atmosphere
kinetic energy of the wind
absorption into atmosphere 19%
friction heat
absorption into the surface of the earth 47%
latent heat in water vapor 23%
conduction, convection, and radiation 14%
0.2%
ocean current

If man's energy consumption becomes equal to the amount of meteorological energy, the possibilities are that abnormal meteorological phenomena will be more likely than ever to take place. Consequently, this level of meteorological energy can be reasonably regarded as a limit for man's energy consumption. As stated before, it will take some sixty years for man to come up to this level, if consumption increases at the present rate. This is, of course, the case for the earth as a whole. Needless to say, there are many places on earth where no energy is consumed by mankind; in contrast, there are places where it is consumed very heavily. Energy consumption on the earth is gradational according to location. Tables 1 and 2, above, show consumption density by nation.

As I have already explained, when man's energy consumption increases by sixty times, it will reach the level of meteorological energy. According to table 2, Japan's energy consumption is 370 times greater than the world average (about 12 t/km² per year), and there are ten nations whose energy consumption exceeds 60 times the world average. However, abnormal meteorological phenomena do not occur as frequently as is generally imagined, so that even if the total energy consumption on earth should become 60 times greater than the present total, a realistic limit from a regional point of view would seem to be a level 500 times more than present consumption. Supposing that a level 500 times greater is taken as 1 and each nation's amount of energy consumption in habitable land areas (as shown in table 2) is scaled accordingly, table 3 can be obtained.

Let us, then, once more discuss the aforementioned line of discontinuity of energy. As has been explained, Japan consumes energy at an extremely heavy rate in

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Table 3. Degree of Danger as Seen from the Point of Energy Consumption Density (1970)

Japan	0.74	France	0.09
Belgium	0.52	USA	0.08
Netherlands	0.48	Canada	0.05
West Germany	0.34	USSR	0.03
United Kingdom	0.23	Argentina	0.003
Italy	0.11	Australia	0.002

the world picture. Yet, there do exist other nations whose energy consumption is comparable to hers. In spite of this fact, Japan seems to show a conspicuously high frequency of abnormal meteorological phenomena. This leads us to question whether we should take heed of the existence of a line of discontinuity rather than the energy consumption level. Let us, as a trial case, look within Japan. Lately, large cities of Japan, such as Tokyo and its environs, have been frequented by small tornadoes. Since the energy consumption density of a mammoth city such as Tokyo seems extremely high, there would seem to be a rather extensive line of discontinuity of energy in the surrounding area. Although I am not now able to clarify this in relation to the frequent occurrence of tornadoes, I feel the problem is worth probing into hereafter.

In any event, I would like to call your attention to the fact that lately, in the advanced industrialized nations, the energy crisis is being clamorously discussed in terms of the supply not being able to meet increasing demands. (Japan is no exception in this.) But if we have a sense of crisis only in this respect, then we will feel that the crisis will be solved when nuclear fusion scores a success technologically. In fact, a considerable number of intellectuals share this contention. But does this present a true picture of the reality? Is it not true that man may come to a limit in energy consumption he has never anticipated? I would like once again to draw attention to this problem.

As was made clear earlier, a line of discontinuity of energy is very evidently in existence in Asia, and in this respect Asia is largely different from Europe and America. Today it is widely known that the solution of "North-South" problems is a matter of global concern. As we take note of the phenomenon of the existence of a line of discontinuity of energy, we should also note that the North-South problems existing between Japan and other Asian nations are quite different from those between North America and Central and South America or between Europe and Africa.

Therefore, if there is truth in the hypothesis that the existence of a line of discontinuity of energy triggers a series of abnormal meteorological phenomena (though further studies will have to be made to prove this scientifically), then the most urgent problem in Asia, as I have already stated in the conclusion of section 2.2, is to plan, first, for Japan to curtail her energy consumption and, second, for other Asian nations to increase their energy consumption.

An additional note: Although it may have no direct bearing upon the argument I have hitherto pursued, I would like to mention a problem I feel to be highly important, namely, that because of her physical features, Japan allows an extremely short residence time in the cycling of resources. This I feel may be significant. As is well known, Japan is an island nation with steep mountains and rushing streams, and for this reason pollutants partially sullying the air and water are quickly washed off into the sea. Since residence time in the sea is very long, inflow pollutants remain there for a long time. In other words, Japan has an environment where the encircling seas readily take over pollution from the land. In this sense, Japan's "allowable capacity for pollution" (hereafter I will refer to it as environmental capacity) can be said to be extremely large, for the actual volume is extremely large. Japan, in

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many cases, has the seas to take over pollution and has thus herself avoided pollution. But when we think about pollution on a global scale, we must not allow this kind of "takeover" to continue. We must grasp comprehensively the reality of the environment--including Japan and the waters and skies surrounding her--and we must develop a system of preservation.

2.4 Ways for Japan to Economize in Her Energy Consumption

First of all, let me discuss some measures by which Japan would be able to curtail her energy consumption.

When energy consumption patterns of the USA and Japan are compared, the former's pattern indicates that energy is consumed by industry, homes, and transportation at a ratio of one third each. The latter's pattern is that industry consumes half the energy while homes and transportation each consume a quarter. In other words, industry is given heavy weight in the case of Japan. President Nixon, in his message on energy, appealed widely to the people for a curtailment of energy consumption. His appeal can be said to have been quite effective, for it was made in a nation where energy consumption in homes and by transportation is large. However, even if the same appeal were to be made to the Japanese people, and the people, in turn, tried hard to cut down their energy consumption, the result would not be as effective as in the case of America. This is because Japan, as compared to America, shows an extremely heavy weight in the consumption of energy by industry.

Consequently, in order to effectuate a curtailment of energy consumption in Japan's case, measures must be hammered out to economize in consumption by industry. To achieve this aim, Japan must think of switching over to an energy-saving industrial structure. A question is whether this would mean switching over to the knowledge intensive type of industry mentioned at the very beginning of this paper.

There is, however, one thing that must not be forgotten. Since Japan has almost no natural resources, she has kept on conforming to a pattern in which she imports the greater part of her resources from abroad and exports finished products after processing those resources; therefore, I am afraid that Japan will not be allowed to change her industrial structure to whatever may be her convenience. We must not forget that Japan is intricately involved with those nations which have been exporting raw materials to her and those which have been importing her finished products. We must, first of all, examine what should be done concerning Japan's relations with foreign countries.

Let me, therefore, first clarify the pattern of these relations, then further discuss Japan's future policies. I stated previously that Japan's relations with other Asian nations are different from the North-South problems in Europe and America. I would like to probe into this matter and analyze it concretely.

3. Japan's Characteristics in International Relations

3.1 Differences between Japan and the Industrialized Nations of Europe

Although both Japan and the European nations are industrialized, there is a remarkable difference between them in that Japan is an isolated industrialized nation while the industrialized nations of Europe form a large organization (EC). This difference seems to exert a great deal of influence over their respective relations with developing nations. I would like to clarify this point by using some indices.

Graph 3 indicates Japan's trade pattern. Her relations with importing and exporting nations are illustrated according to the symmetry versus asymmetry relative acceptance method (hereafter referred to as SARAM). The horizontal line of the graph indicates the total volume of bilateral trade, while the vertical line can be considered

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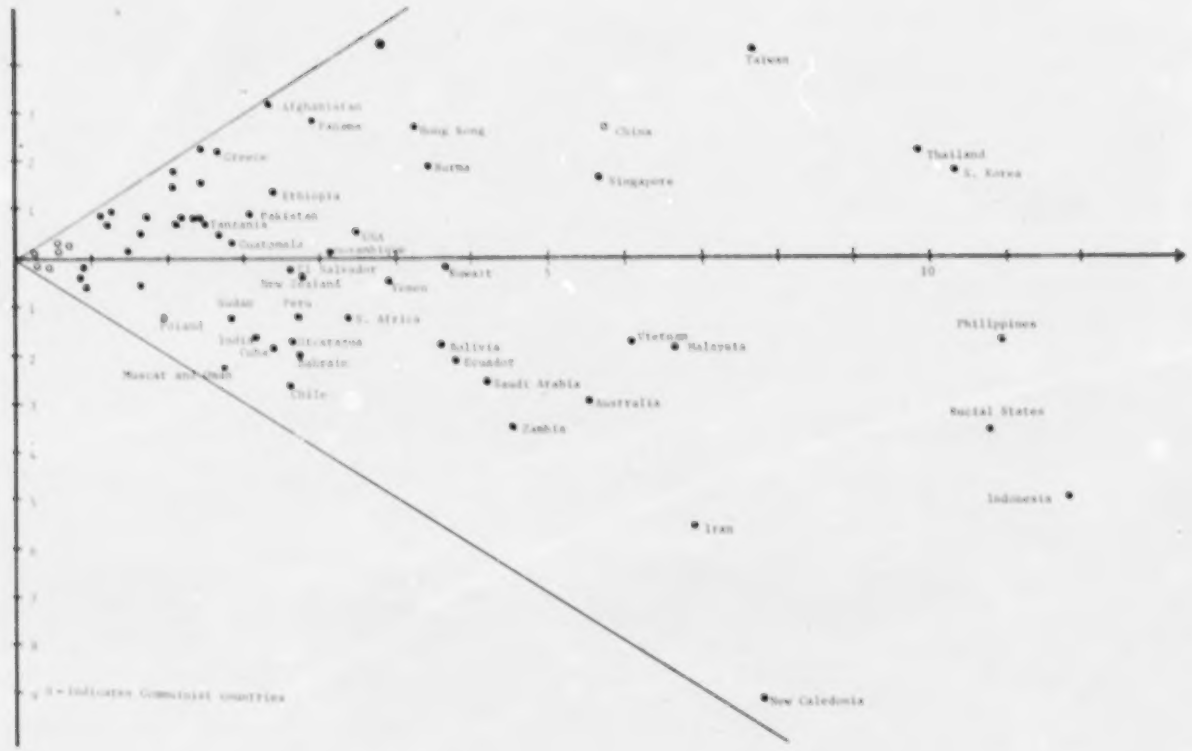
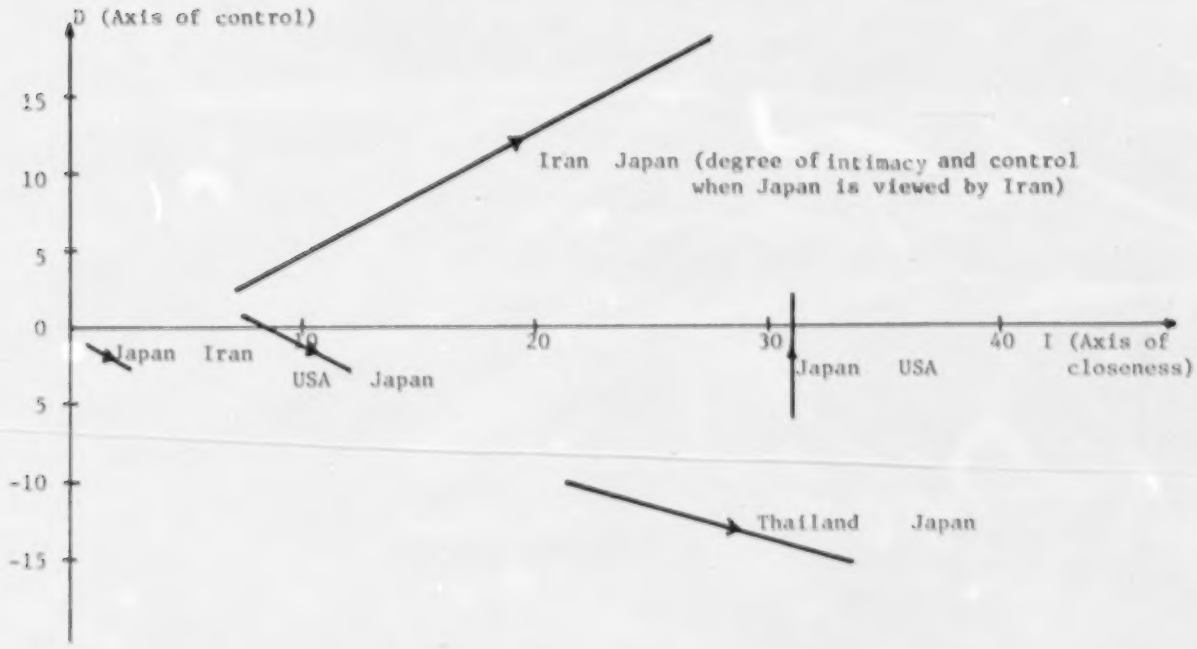
Graph 3. Japan's Trade Pattern (Analysis by SARAM)



Graph 4. Trade Relations of Japan, Iran, Thailand, and the USA and Changes in These Trade Relations (1962-1970)



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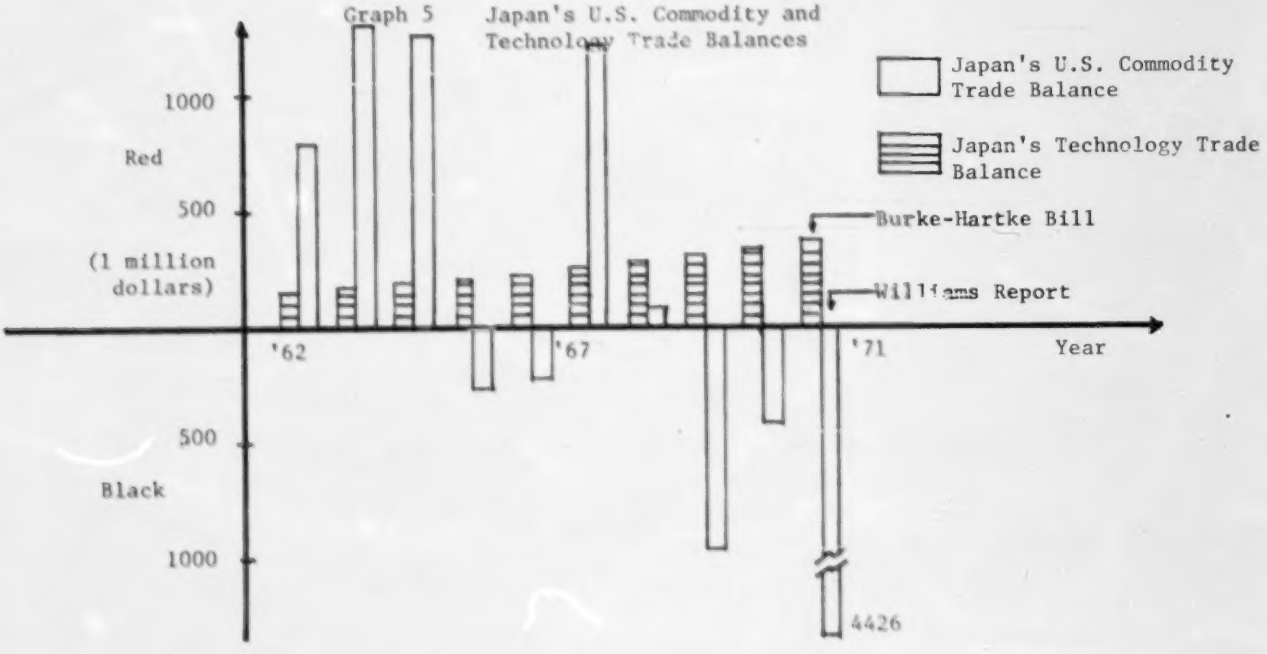
as showing the differences in volume of bilateral trade.[1] Therefore, as we look at the graph, a plus volume on the vertical line indicates excessive export (to the other party this means excessive import), and a minus volume signifies the opposite. Let me tentatively call the horizontal line an index indicating the degree of closeness, and the vertical line an index indicating the degree of control. As you will see in reading note 1, Japan's trade pattern, as compared to patterns of other industrialized nations, cannot be called desirable. That is to say, it is inevitable that Japan be placed in the position of a controlled nation by a number of oil-producing nations, but from the standpoint of Thailand, South Korea, and several other Asian nations she is a controlling nation.

As time goes by, the relationship shown in graph 4 aggravates the latter nations' "subjective symptoms," so that they feel very keenly that they are controlled by Japan. In Japan, on the other hand, no such "subjective symptom" has led to a strong feeling that she is controlling other nations. Therein arises a problem. The reverse of the above can be seen in the relationship between Japan and Iran--a relationship obviously shaped by oil.[2] In any event, as described in note 2, such relationships can be said to be quite undesirable as compared to the trade pattern of any other industrialized nation in the world.

3.2 Japan-US Relations

As elaborated in section 3.1, Japan's foreign trade pattern is quite unbalanced as compared to that of other industrialized nations, especially European ones. This sort of imbalance stems, after all, from the fact that Japan is an isolated industrialized nation, while industrialized nations in Europe fully enjoy advantages deriving from their forming a community. How about Japan's relations with the USA, the country with whom she is supposed to have the closest relations? Graph 5 reveals the characteristics of their relations most symbolically. Namely, Japan in her balance of

Graph 5 Japan's U.S. Commodity and Technology Trade Balances



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commodity trade with the USA once ran rather sharply into the red but in the past few years has been rapidly running into the black. Contrarily, in the aspect of technology trade, she has been consistently in the red every year and, moreover, in the past few years her deficit has been increasing at a swifter tempo. By technology trade, I mean the so-called trade of "know-how," or it may be called "brain trade." In other words, Japan is depending on America's "brain" on one hand, and by exporting to America products which have been produced by utilizing the American "brain," she is going sharply into the black. This trade pattern can never be called desirable.

3.3 Characteristics of Japan's Science and Technology

Let me summarize once again what I have discussed in sections 3.1 and 3.2. For her energy resources, Japan depends 100 percent on imports. Furthermore, she has often relied on the USA for her "brain" resources. By laying a foundation on imported energy and imported "brain," she carries out various forms of technological development, constructs mammoth industries, and exports numerous industrial products produced in Japan. Moreover, when she deals in exports, she gives no consideration to the other party's position. As a result, her trade often ends in an unbalanced pattern which is not necessarily desirable in the eyes of the other party. This sort of pattern is undesirable not only for the other party but also for Japan herself and her future.

How, then, do the characteristics of the science and technology that has supported Japan's behavioral pattern differ from those of other industrialized nations? I would like to examine this question. First of all, when the correlation between a nation's economic level and her scientific and techical level* is looked at by applying the PCA (principal component analysis) method, graph 6 can be obtained.

This graph makes it clear that the scientific and technical level and the economic level are closely correlated; however, their correlation is not always linear. In a developing nation, when the scientific and technical level is lifted, the economic level also rises considerably. (Please note that the incline is gentle.) On the other hand, in the case of an industrialized nation, the economic level will not rise unless the scientific and technical level is lifted considerably. (Please note that this incline is steep.) Speaking conversely, in a developing nation the economic level must be lifted considerably if that nation would like to raise its scientific and technical level a little. We must consider this point carefully when we adjust our relations with industrialized nations.

Incidentally, it becomes clear in graph 6 that Japan, an industrialized nation isolated in Asia, exhibits a very high scientific and technical level. However, how does the nature of her science and technology differ from that of other industrialized nations? How does it characterize her?

In the first place, let us apply twelve indices to the following thirteen nations: Belgium, Canada, France, West Germany, Italy, Japan, Netherlands, Sweden, United Kingdom, USA, Switzerland, Denmark, and Austria. The indices are:

Number of Nobel Prize recipients/population
Number of computer installations/population

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* To check on economic levels, I referred to two indices: national income per capita and ratio of agricultural to industrial population. To obtain scientific and technical levels, I used the folliwng four indices: ratio of students belonging to a faculty of science to total population, ratio of students belonging to a faculty of engineering to total population, ratio of domestic patent registrations to domestic population, and ratio of Nobel Prize recipients to total population.

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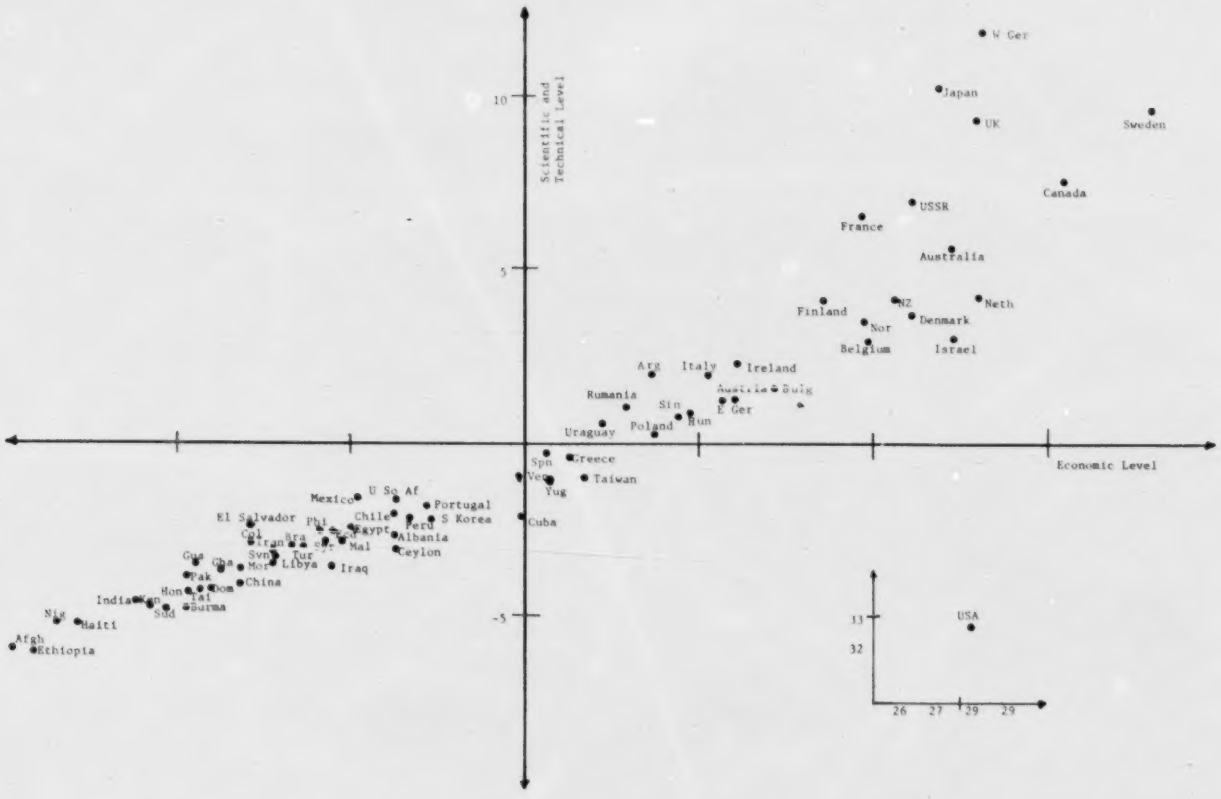
Graph 6. Economic, Scientific and Technical Levels of Various Nations



Atomic power output/population
Number of technological innovations/population
Number of patents registered by natives/population
Amount of technical aid/population
Output of crude steel/population
Amount of imports of raw materials/total amount of imports
Amount of product exports/total amount of exports
Number of rooms/population
Amount of energy consumption/habitable area
Number of registered designs/population

In general, industrialized nations appear to have higher indices as compared to developing nations. However, the industrialized nations do not necessarily maintain similar levels in all indices. Each has relative predominance over the others in a different index.

* Those nations whose indices of atomic power, computers, technological innovations, and Nobel Prize winners show relative predominance have an ultra-advanced type of science and technology.

* Those nations whose indices of patents registered by natives, technological innovations, registered designs, product exports, and raw material imports show relative predominance have a processing trade type of science and technology.

* Those nations whose indices of registered designs and technical aid show relative predominance have a "soft" science and technology type.

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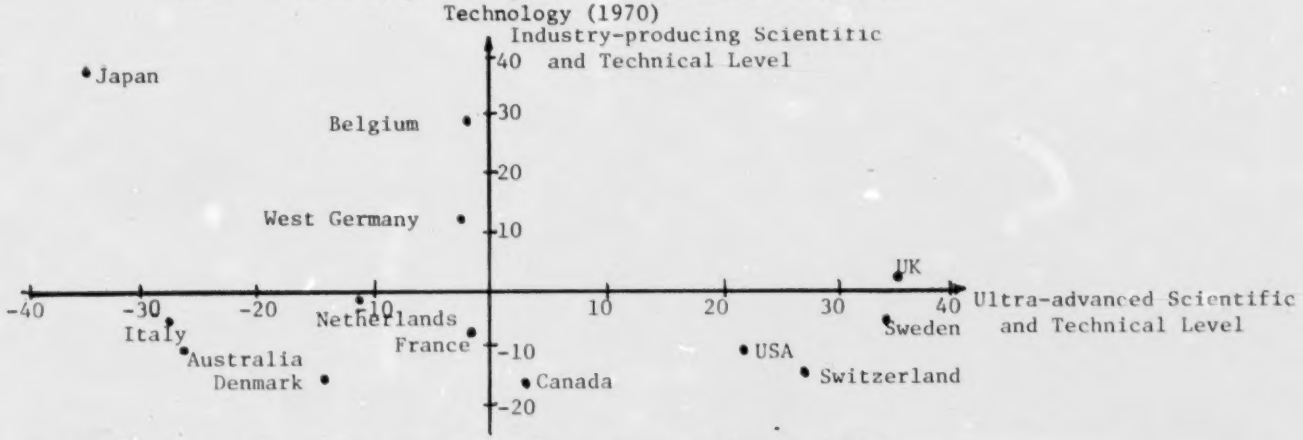
* Those nations whose indices of crude steel production, energy consumption, and raw material imports show relative predominance have an industry-producing type of science and technology.

Graphs 7 and 8 show the results of analyses by the PCA method of the aforementioned thirteen industrialized nations, as to which of the above four categories characterizes their respective type of science and technology. From these graphs, we seem to be able to say the following:

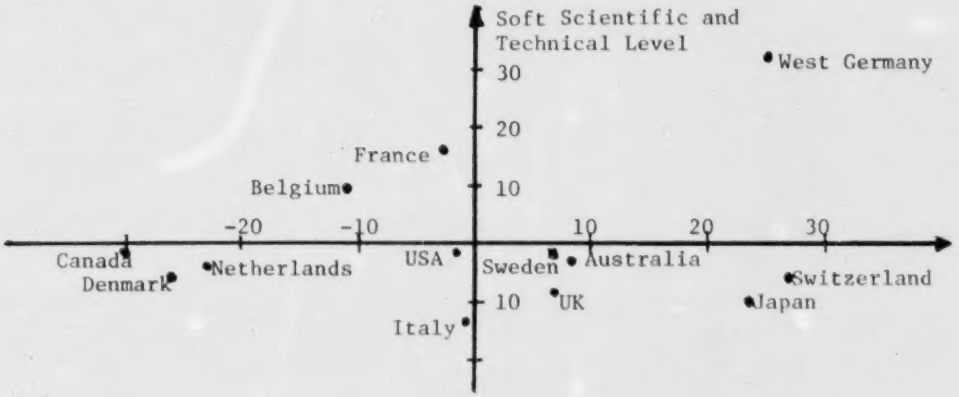
First of all, the USA and UK are similar in nature in that they incline conspicuously toward the ultra-advanced type of science and technology. As compared to this high inclination, their levels in the other types can never be called high; in fact, they are rather lagging behind in these respects.

Next are the cases of Japan and West Germany. These two nations are high in their levels of industry-producing and processing trade types of science and technology. In other words, they are typical representations of an industrial type of science and technology. These two nations make quite a contrast to the USA and UK.

Graph 7. Scientific and Technical Levels of Thirteen Advanced Nations in Terms of Industry-producing and Ultra-advanced Science and Technology (1970)



Graph 8. Scientific and Technical Levels of Thirteen Advanced Nations in Terms of Soft and Processing Trade Types of Science and Technology (1970)



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Yet, while Japan and West Germany are similar in the point that an industrial type of science and technology has been developing in both nations, they are very different in the point that West Germany holds a very high level in soft science and technology while Japan shows a very low level in it. This is a point of importance. When we recall that the index of the soft science and technology type represents the number of registered designs and cases of technical aid, we can say the following: West Germany reflects the outcome of an industrial-type science and technology reaching out into developing nations, while Japan's record in practicing the same is unsatisfactory in that she is still interested in exporting products and acquiring foreign currencies. In the field of ultra-advanced science and technology, West Germany maintains predominance over Japan; that is, Japan's science and technology is lacking in creative power. In other words, Japan has not yet left the stage of "borrowed science and technology."

France is superior in the fields of ultra-advanced and soft science and technology, especially the latter, and this fact may be attributable to her controlling the nations that were once French colonies. In any event, France does not have an industrial-type science and technology and in this respect makes quite a contrast with West Germany.

Switzerland, Sweden, the Netherlands, and Belgium have switched over to concentrating on specific industrial fields, and they maintain a high scientific and technical level in their respective fields. Switzerland, especially, is a nation possessing the industrial-type science and technology, and her unique characteristic is observable in the fact that she also retains strength in the ultra-advanced type. Sweden shows a nature very similar to Switzerland's.

4. New Relationships in the International Division of Labor in Asia

The following can be suggested from what I have discussed sections 2 and 3.

While it could not be helped that Japan became an isolated industrialized nation in Asia (especially as compared to European nations), the time has now come for Japan to transform herself. The development of science and technology in Japan has indeed been remarkable; however, Japan will have to launch a new venture to change her nature. What is it, then, that Japan will have to do to meet this end?

First of all, Japan must contribute more positively to the industrialization of other Asian nations. By doing so, it is to be hoped that Japan would be able to reshape her relations with other Asian nations into well-balanced and interdependent ones. It would be better, however, if Japan acted in cooperation with other industrialized nations, striving together to meet this end instead of undertaking the task singlehandedly. It becomes clear, without looking at precedents in Europe, that a compartmentalization of industrialized nations is effective in doing away with a line of discontinuity of energy and in creating well-balanced international relations. However, since Europe and Asia differ from the outset in their international environment, it is not to be expected that a mechanism similar to that in Europe--that is, a compartmentalization of industrialized nations--will be immediately transplanted in Asia. As a solution, what I feel to be necessary is the achievement of a functional compartmentalization transcending regions, rather than a regional compartmentalization as carried out in Europe. The OECD may well be expected to be one stage in achieving this goal; however, we must strive to create a new mechanism going beyond existing stages.

In order to achieve this task, Japan will have to change the nature of her science and technology. She has hitherto inclined heavily toward the industrial type and has been lacking in the ultra-advanced and soft science and technology types. In her case, however, the ultra-advanced type should be developed in specific and concrete

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ways, and we should thoroughly examine the cases of Switzerland and Sweden in Europe. What Japan should emphasize most is soft science and technology. The indices for the soft science and technology type given in section 3 are very limited because of a lack of available data. The soft science and technology I advocate here is not limited, but is to include comprehensively all science and technology useful for social development. This new soft science and technology must be in accord with what I described in section 1 of this report. That is, Japan's industrial structure must be gradually shifted from the traditional raw material and processing stages to the assembly stage. I also stated that a "knowledge intensive" industrial structure must be promoted. As a necessary condition to reach this end, a shift from the industrial-type science and technology to soft science and technology must be emphasized. (The industrial type has agreed with Japan's policy hitherto, which has shown an inclination to shift Japan's industrial structure toward heavy and chemical industries.) Japan has to transform herself in the above manner, while at the same time she must positively carry out technology transfer to other Asian nations, that is, transfer of industrial-type science and technology and certain phases of the raw material and processing stages of heavy and chemical industries growing at its base. Of course, no smooth execution of this task can be anticipated. However, even if it takes a long period of time, Japan will have to play the role of a promoter in creating new relationships in the international division of labor by discussing the matter with many Asian or other developing nations. Functional compartmentalization should not be carried out only with other industrial nations but should include developing nations as well. We must not forget this point.

Needless to say, technology transfer should not be accompanied by pollution transfer. Certainly it is a well-known fact that many heavy and chemical industries have polluted Japan's land and skies and have victimized many people. Therefore, if such technology were to be transferred, it would obviously turn out to be pollution transfer. Whether Japan is to carry out technology transfer or not, she must thoroughly examine the technology that has supported industries causing pollution and must develop a new technology that would prevent any industry from bringing about pollution. There are some Japanese who claim that if such technology is to be developed, it ought to be brought to flower in industry at the hand of the Japanese. However, Japan has no resources to start with, and her possession of industries in the raw material stage is inappropriate from the point of view of the international division of labor. All in all, she should think of technology transfer to other nations.

Now, in order to develop technology which is to form the basis of non-polluting industries, we must have a way of thinking that deviates slightly from the traditional one. That is, we must have a different point of view than that which makes efficiency and economic effect all important. We must, first of all, set up places for new research and study. Institutes under the control of the government and non-profit "think tanks," not to mention universities, should make themselves bases for development of such new lines of study.

5. Necessity to Develop a New Scale for Perception of Environmental Quality

Finally, I must say one more important thing. That is, many industrialized nations have given technical assistance and have carried out technology transfer to developing nations. Have they not, however, experienced repeated failures because of differences in values, reflected in different views of the environment, between assisting nations and assisted nations or between the technology transferor and the technology transferee? Have there not been cases where valuable assistance has not displayed anticipated effects, or where the transferor thinks of the technology transfer as bringing prosperity while the transferee regards it as doing harm? Japan, especially, should reflect seriously on her own record in this regard.

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We must develop a concrete scale to measure and determine the conditions of the most desirable environment for each society and for the people who actually reside in it. An environment desirable to one man may not be desirable to another if their values are different. Or there may be cases in any society of an environment being both desirable and undesirable. We must clarify these matters one by one.

The writer happens to have been invited to the Conference of Experts held in Paris in March, 1973, in connection with UNESCO's MAB [Man and Biosphere] Project 13. The theme of the conference was "Perception of Environmental Quality," and he found the sessions extremely useful and fruitful. The Institute for Future Technology had been conducting a survey on "What the People Want in Their Environment," commissioned by the Environmental Agency of the Japanese Government, and had already developed a new method for surveying awareness, namely, the Second Dimension Delphi Method.* It decided to expand its survey by applying results of the Paris conference.

The survey can be roughly divided into two parts. One is a continuation of the research commissioned by the Environmental Agency, namely, a survey by questionnaire and interview of what the people want in their environment. It happens that this survey is now being carried out in cooperation with the State University of New York at Buffalo, as per their proposal made in June, 1973. Four nations--the USA, Norway, Brazil, and Japan--are joining in this research. The aim is to survey people's wants concerning the environment under various historic, geographic, social, economic, and political conditions, and to find a scale for perception of environmental quality by analyzing the results of the research. This joint project, described in appendix 1, will be tied to UNESCO's MAB Project 13. The First International Working Session was held in Buffalo, October 1-3, 1973.

The second part comprises research commissioned by the Economic Planning Agency of the Japanese Government. The goal is to learn about inhabitants' awareness of the environment by having various local inhabitants take photographs of their environment, allowing them freedom to choose whatever subjects they wish. This research is presently being conducted through the following procedures:

1. People of different ages and occupations are selected from various areas with diverse conditions throughout Japan (from Hokkaido to Okinawa). They are asked to use their own judgment in submitting photographs of "A place I like" and "A place I don't like." Photographs taken in this manner are evaluated by the photographers themselves: "I like (dislike) this scene very much" or "I like (dislike) this scene a little." Further, we ask them to include brief comments when they send in the photographs, as to why they evaluated them in such a way.

2. The collected photographs are analyzed. (Some five thousand have been collected so far.) That is, various bits of information contained in each photograph are extracted. We extract and pigeonhole, as objective information, such data as the subject of a photo, the condition under which it was taken, the photographer's own evaluation, and his reason for so evaluating it.

3. Members of an evaluation committee analyze and evaluate these pieces of information. (A committee consisting of specialists has already been formed.) We will try to find out which environmental conditions are liked (or disliked) by large numbers of inhabitants.

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* In research using the Delphi Method, there often occurred the contradiction that two absolutely incompatible conditions in trade-off relations became established simultaneously as answers. In order to eliminate this contradiction other methods such as the cross-impact method have been tried. In the Second Dimension Delphi method, two answers appearing simultaneously from the conditions in trade-off relations are constringed in the 2nd dimension.

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4. The next step is to conduct research to discover whether or not the evaluation committee's conclusions agree with the photographers' evaluations. We make a photomontage containing environmental information--that is, information perceived by the evaluation committee members as representing what many inhabitants have evaluated as desirable (or undesirable). We mail copies of this photomontage to those who submitted photographs to us, and we have them evaluate it. If their evaluation is in accord with that of the committee members, the results are consistent and there is no problem. But in cases where the photographers' evaluation disagrees with the committee's, the same procedure is repeated--another photomontage is made and copies are mailed to the photographers, who again evaluate it.

5. By repeating these steps, we will be able to find the environmental conditions which many inhabitants call desirable. Under what variation of conditions does a desirable environment turn into an undesirable one, and what variations of conditions are necessary to regenerate a desirable environment out of one that is undesirable? We attempt to clarify these points (see appendix 2).

We call this research method the Photographic Delphi Method. It was developed, as described above, by the Institute for Future Technology, and is being applied to research now in progress. It will take about six months for us to ascertain its success or failure. We feel that this method is superior to conventional research methods in that inhabitants are able to give free expression to their own ideas. In a survey carried out by the conventional questionnaire method, questions are made up in advance and, therefore, informants are influenced by the researcher's preconceived notions. On the other hand, this method has its shortcomings in that the procedure is rather cumbersome.

In any event, if this method proves fully effective in developing a scale of man's perception of environment, we will then wish to launch a joint project to carry out research by a similar method in countries other than Japan.

If this should be the case, and if we are able to secure their consent, we would like to conduct a tripartite research in the USA (Hawaii and California), South Korea, and Thailand. (In such a case, the composition of the evaluation committee would, of course, be international.) The reason behind this wish is that these nations are, in many ways, very closely related to Japan. Japan has already implemented many instances of economic cooperation and technology transfer with them. We would indeed like to know how the local inhabitants take these endeavors--that is, their true feelings.

To bring success to this joint research, it would indeed be our delight if we could join hands with the East-West Center in its proposed program on "Environment and Policy." We would like to carry out this research strictly from an academic standpoint, and so we are in the process of applying to the Ministry of Education for a special science research grant. If our application is granted, we will make a fresh start on this research as a joint venture of the Institute for Future Technology and the Tokyo Institute of Technology.

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NOTES

1. R. Savage and K. Deutsch introduced relative acceptance (RA) as an index indicating the degree of interdependence between two nations. (See "A Statistical Model of the Gross Analysis of Transaction Flows," Econometrica 28, no. 3 [July, 1960]:551-572.) RAij is obtained by dividing the difference between Tij (the actual amount of transactions between two nations, i and j) and Eij (the anticipated amount of transactions) by Eij. That is to say,

$$RAij = \frac{Tij - Eij}{Eij}$$

The anticipated amount of transactions, Eij, here means the amount of transactions between i and j when these nations transact equally with all nations in proportion to the respective amount of their transactions in the sum total of world transactions. (The amount of transactions increases with a larger nation while it decreases proportionately with a smaller nation.) This can be expressed by the following equation:

$$Eij = \frac{Tio}{Too} \times \frac{Toj}{Too} \times Too$$

Therefore, $RA^{s}ij = RAij + RAji$ expresses the sum of the degrees of relative independence of i and j; that is to say, it shows the extent of their relationship. The equation $RA^{a}ij = RAij - RAji$ seems to indicate the difference between i and j in their relative interdependence; that is to say, it shows a degree of relative control. Therefore, we can illustrate the degree of relative closensss and degree of relative control of a nation in relation to other nations in the world by making RA^{s} the axis of abscissa and RA^{a} the axis of ordinate. This method of illustration is called the Symmetry versus Asymmetry Relative Acceptance Method (SARAM). As is indicated in figure N-1, the whole is divided into four different domains, and nations belong to these as follows:

Domain I -- A nation in this domain is subject to i's control. Despite the fact that this nation's degree of dependence on i is quite high, i does not depend on this nation to the same extent.

Domain II -- A nation in this domain has interdependent relations with i, for this nation is close to i but is far from establishing any controlling or controlled relationship with i.

Domain III -- A nation in this domain has an opposite relationship to a nation in Domain I; that is to say, this nation controls i.

Domain IV -- A nation in this domain is originally very distant in its relations with i, or purposely avoids establishing any relations with i for some reason.

A characteristic of this method of analysis is that it is able to express, to some extent, degrees of relative closeness and control (any national scale being set aside). However, in the relationship between two nations, especially that between a controlling nation and a controlled nation, a national scale (herein meaning an economic scale) exerts a great deal of influence. If we were to give due consideration to this point, we would have to employ concurrently the percentage comparison method (which I discuss in note 2) in carrying out an analysis.

Now, in analyzing various bilateral trade relations by SARAM, we were able to obtain the following results.

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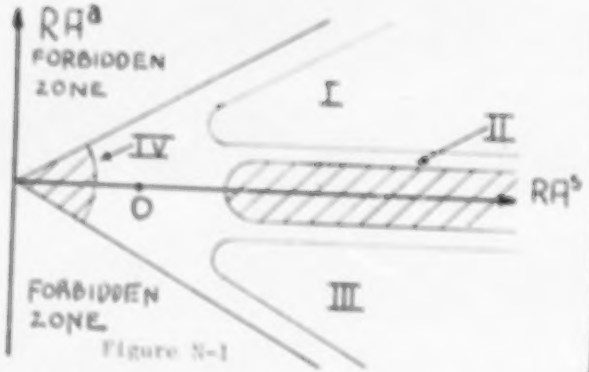

Figure N-1

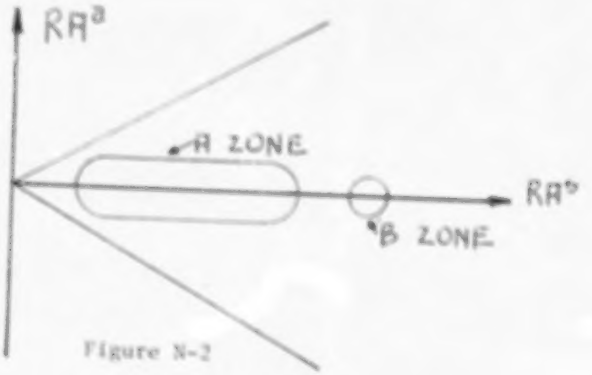

Figure N-2

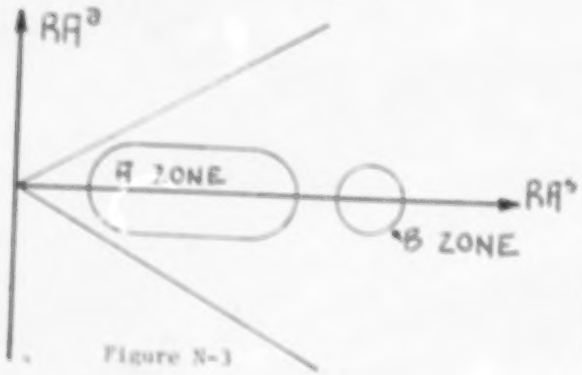

Figure N-3

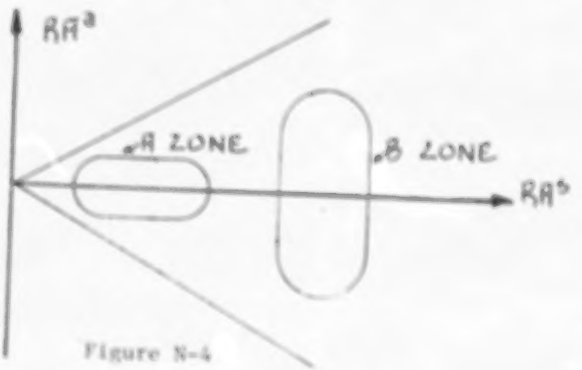

Figure N-4

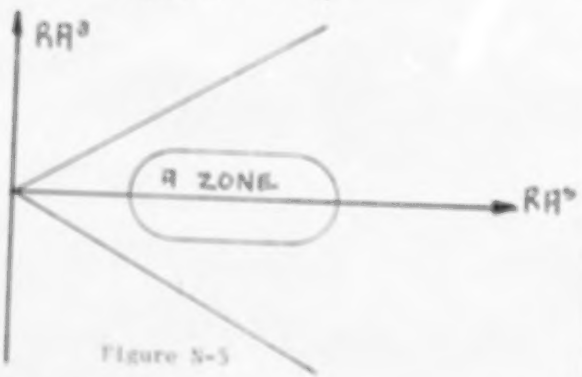

Figure N-5

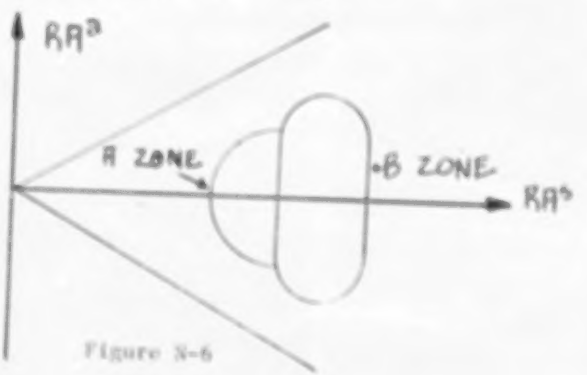

Figure N-6

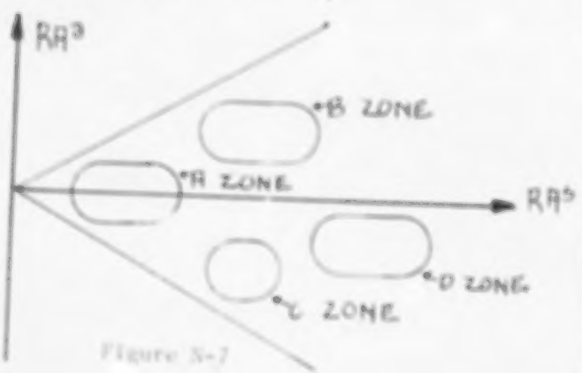

Figure N-7

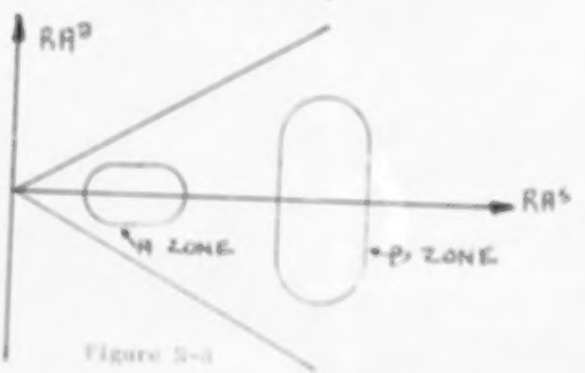

Figure N-8

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A. Patterns in Industrialized Nations of the Free World

In general, we could single out six characteristic patterns. The first pattern is as shown in figure N-2, and representative nations displaying this pattern are Switzerland, Canada, and Ireland. In these nations both horizontal and vertical ranges of Zone A are narrow. In other words, they can be regarded as nations that maintain trade relations with many nations equally distant from one another. In the case of Switzerland, the corresponding nation in Zone B would be Austria; in the case of Canada, the USA; and in the case of Ireland, the United Kingdom. These pairs of nations are all close geographically, and each pair of nations forms close and interdependent trade relations. In all cases, neither nation controlls the partner nor is controlled by the partner.

The second pattern is as shown in figure N-3. This pattern closely resembles the first but is different in that the number of nations belonging to Zone B is larger. Both horizontal and vertical ranges of Zone A and Zone B are narrow, and each nation trades with other nations remaining at an almost equal distance as in the case of the first pattern. Nations representing this pattern are Belgium and the Netherlands. In the case of Belgium, nations belonging to Zone B are the Netherlands, West Germany, and France; in the case of the Netherlands, they are West Germany and Belgium.

A third pattern is as shown in figure N-4, and the representative nations are Austria, France, Norway, Finland, Greece, Iceland, and Sweden. The characteristic of this pattern is that Zone A is similar to the one in the first and second patterns, but the vertical range of Zone B is wider, indicating that there exist controlling-controlled relationships between nations with this pattern and other nations. Let us look at France, for example. Those nations belonging to Zone B are Muscat and Oman, New Caledonia, Cameroun, Gabon, Tunisia, Morocco, and Algeria. France's trade relations with Morocco are very intimate. France is in the position of control with relation to Muscat and Oman, New Caledonia, Cameroun, and Gabon, whereas it is in the position of being controlled in relation to Algeria. (This relationship can be explained by the fact that Algeria is a vital oil supplier to France.)

The fourth pattern is as shown in figure N-5, and the representative nations here are West Germany and Italy. The characteristics of this pattern can be epitomized as follows: A nation with this pattern has no especially close relation with any other nation but maintains pluralistic and close but not exclusive trade relations with many nations.

Nations showing the four patterns I have described so far have, with some exceptions, established trade relations with many other nations but have been equally distant from them all. These four patterns can be called desirable, for there is no lopsided relationship of controlling or being controlled recognizable in them.

The fifth pattern is rather different. It is shown in figure N-6 and, from the explanation I have made so far, this pattern is not desirable. The representative nations are the United Kingdom and Japan. Let us examine their cases in a bit more detail.

First of all, in the case of the United Kingdom, the nations belonging to Zone A are the so-called nations of the "North." Contrarily, those belonging to Zone B are nations of the "South," and they were once colonies of the United Kingdom--Cyprus, South Africa, Sierra Leone, Guinea, Nigeria, Ghana, Uganda, Zambia, Tanzania, etc. What is recognizable even among nations in Zone A is that the closer they are to Zone B, the greater the number belonging to the "South."

Next, let us look at the case of Japan. Nations belonging to Zone A are mostly the so-called industrialized nations of the "North," such as the United

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Kingdom. However, the nations belonging to Zone B are mostly developing nations in Asia and the South Pacific area, including Taiwan, South Korea, Thailand, Philippines, Indonesia, New Caledonia, Iran, Malaysia, South Vietnam, Australia, and Singapore. As was evident in the case of the United Kingdom, the number of nations of the "South" increases with closeness to Zone B. Let me select Thailand and Iran from among the Zone B nations, as holding characteristic positions.

(1) Japan-Thailand Relations

Japan's proportion of trade with Thailand is 1.67 percent (1970) of her overall trade, while Thailand's proportion of trade with Japan is 33.54 percent (1970). Thailand shows a 15.31 percent excess in imports with reference to Japan. In relation to its second largest importer, the USA, Thailand shows a 14.48 percent excess in imports. Based on this fact, we can say that Thailand's dependence on Japan is abnormally heavy. Moreover, to make matters worse, the situation indicated in graph 4 (p. 26) brought about, between 1962 and 1970, heightened feelings on the part of Thailand of being controlled by Japan, whereas Japan was lacking in perception of how she stood in Thailand. This fact should be considered seriously by Japan.

(2) Japan-Iran Relations

As is indicated in graph 4 Japan-Iran relations are contrary to those between Japan and Thailand; in other words, Japan can be said to be controlled by Iran. Indeed, as of 1970, Iran's trade balance indicates an excess in imports of 17.65 percent, the cause obviously attributable to oil. However, Japan is not necessarily in the position as Thailand in Japan-Thailand relations, with regard to her relations with Iran. In Japan's overall trade, Iran's share is 27.45 percent. For Iran, the second and third largest trading nations are West Germany and America, and their trade amounts to 14.23 percent and 10.45 percent respectively (1970 figures). By looking at this fact alone, Japan's relative importance can be seen. In other words, there is a wide gap between Japan's importance to Iran and Iran's importance to Japan, and Iran can be said to be quite dependent on Japan. In spite of that, their bilateral relations give the appearance that Japan is being controlled by Iran. In fact, as Japan faces this recent oil crisis, weak points stemming from this unbalanced relationship are immediately brought to light.

Finally, the sixth pattern is as shown in figure N-7, and a representative nation is the United States of America. Zone A nations are the so-called nations of the "North," and their mutual relationships are, in general, desirable and close. Zone B nations are Bermuda, South Vietnam, Israel, and Bolivia. Nations included in Zone C are Trinidad and Tobago, Ethiopia, and Panama. Both Zone B and Zone C nations are developing nations of the "South," and they have established unbalanced trade relations with the USA (in some cases, controlling, and in other cases, being controlled), either as raw material suppliers or as markets for US-made products. Nations included in Zone D are Canada, Mexico, Bahamas, Dominican Republic, etc. These nations show superficially subordinate relations with the USA; however, the US relations seems to be considerably affected by multilateral enterprises having their headquarters in the USA.

B. Trade Patterns of Developing Nations

When the trade patterns of developing nations are compared and examined by an application of SARAM, they do not necessarily present fixed patterns. Each is rather different from the others. However, the following characteristics can be cited tentatively:

* They show a smaller number of trading nations as compared to cases of industrialized nations.
* Their trading nations are limited geographically.

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* Trade relations among nations of the "South" are not necessarily interdependent, as in the case of industrialized nations (especially the European ones), and in this respect their trade relations are quite unstable.
* In many cases they establish rather extensive interdependent relations with one or more nations of the "North."

C. Trade Patterns of Communist Nations

The USSR, Romania, Poland, Hungary, East Germany, Czechoslovakia, and Bulgaria show a pattern as in figure N-8. Zone A nations are Arab nations, including Egypt, Iraq, and Syria, and emerging nations in Africa, including Tanzania, Uganda, and Mozambique. Zone B nations are Communist nations, including the USSR, Romania, Poland, Hungary, East Germany, Czechoslovakia, and Bulgaria. That is to say, Zone A nations are friendly developing nations and Zone B nations are Communist nations. The characteristics of this pattern can be summarized as follows:

* As compared to industrialized nations in the Free World, they are limited in selecting their trade partners.
* Ties among Communist nations are very solid, and they form a very cohesive trade circle. Their relationships can hardly be called interdependent. In other words, they are characterized rather strongly by a relationship such as this: A controls B but is controlled by C.

Communist nations other than those mentioned above--for instance, China, Yugoslavia, Cuba, etc.--each show very unique patterns.

2. Although analyses by SARAM clarify bilateral trade patterns by making clear the content of a bilateral relationship (i.e., whether it is a relationship of controlling or being controlled, or whether it is an unbalanced or interdependent and equal relationship), they do not make clear "subjective symptoms." When we talk of a relationship of controlling and being controlled, what comes into question is the extent of these "subjective symptoms." Thus, as a means of measuring their extent, the percentage comparison method has been developed. In other words, this method is used to measure the percentage of the trade of a nation (j) in the overall amount of trade of another nation (i). This is called the degree of absolute dependence (Tij) of i on j. That is,

$$Tij = \frac{Tij + Tji}{Tio + Toi} \; ; \sum_{j} Tij = 1$$

Next, as compared to i's overall amount of trade, what is the extent of the imbalance in trade between i and j? That is to say, let us think of an index (Dij) indicating the degree of i's predominance over j and the degree of i's control over j.

$$Dij = \frac{Tij - Tji}{Tio + Toi} \; ; \sum_{j} Dij = \frac{Tio - Toi}{Tio + Toi}$$

In order to perceive i's foreign trade pattern first, Tij and Dij are to be obtained by varying trade partners diversely (which means to change j); then, a chart is to be drawn making T the axis of abscissa and D the axis of ordinate. In this case, the denominator for both T and D is the overall amount of trade of a nation, and the numerator is either the sum or difference of two nations'

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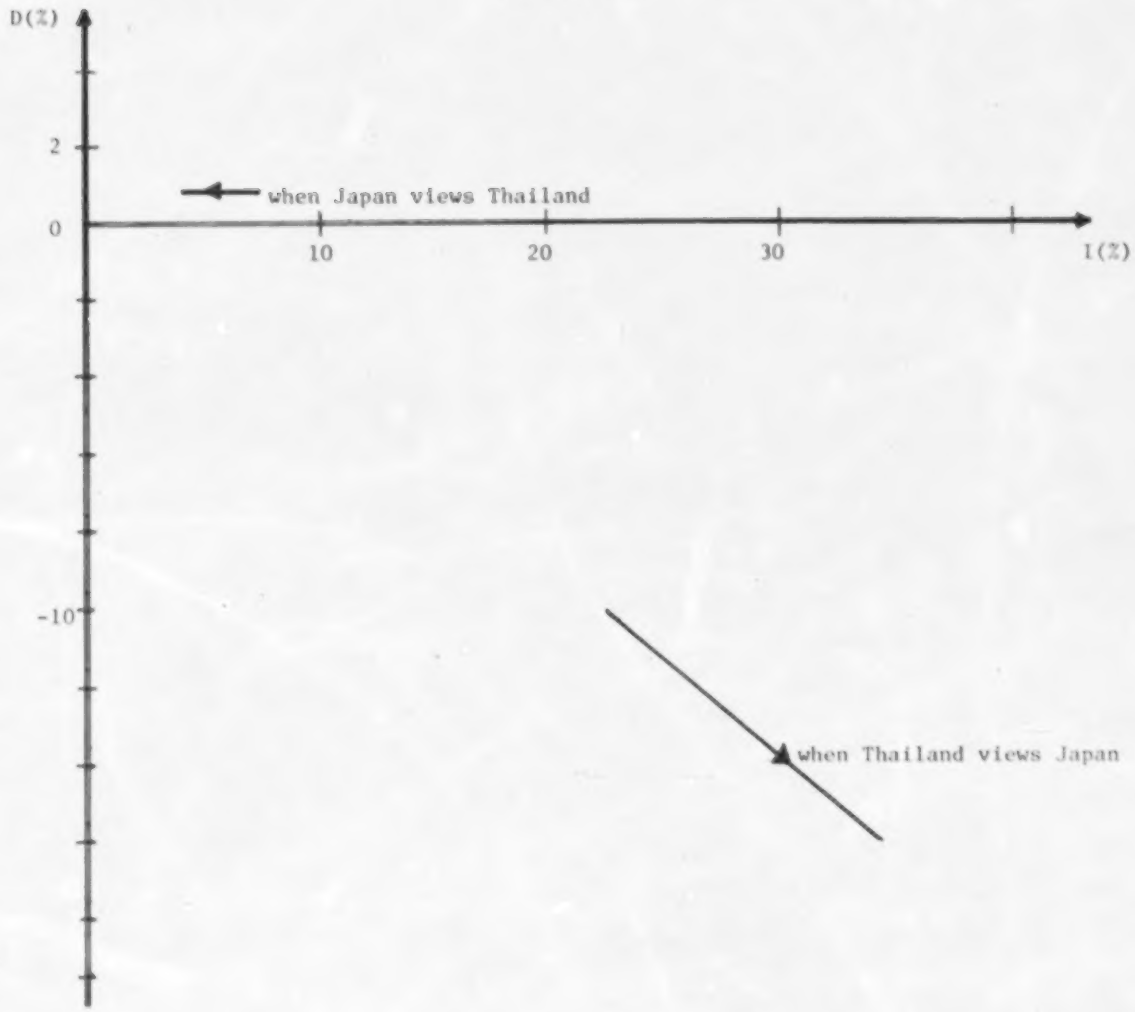
amount of trade. Therefore, in the case of i and j, especially when i's overall amount of trade is very much larger than that of j, neither increase nor decrease of the numerator has much bearing upon i. On the other hand, in the case of j, any change in the numerator affects it perceptibly. In other words, this difference could be called the difference in "subjective symptoms" between i and j. I have shown some examples in graph 4 (p. 26). Graph N-1 is an illustration of Japan-Thailand relations when they are extracted specifically. In other words, Japan is not conscious of controlling Thailand even to the least degree, but on the part of Thailand there is a keen feeling of being controlled by Japan. Moreover, when 1962 is compared to 1970, it is evident that Thailand's weight in Japan's trade has become lighter while Japan's weight in Thailand's trade has become heavier than ever. This fact speaks for itself in explaining why "subjective symptoms" have scarcely been felt in Japan while they are felt more sharply than ever before in Thailand.

Graph N-1. Japan-Thailand Trade Relations
(1962-1970)



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APPENDIX 1

ENVIRONMENTAL BELIEF STRUCTURES:

Content, formation, and relationship to future policies

Project Report I
October 22, 1973

Contents

Brief Project Description

- Why are environmental beliefs important?
- What is the design of the project?
- What can we hope for from these studies?

Progress Report as of October 15, 1973

- First International Working Session
  - Agenda
  - Participants
  - Agreements
- Status of the national teams
- Tasks to be done before next International Working Session

BRIEF PROJECT DESCRIPTION

Why are environmental beliefs important?

The time will come when problems arising from what we call the environmental problematique will force upon societies of the world the need to change in fundamental ways. The environmental problematique may be described as a set of interconnected problems which include:

Continued sharp increase in population

Sharply increasing water and air pollution

Increasing rates of consumption of irreplaceable natural resources

Increasing probabilities of catastrophic accidents

Constant pressures for greater industrialization and urban growth

Continued exploitation and ruination of lands, forests, waters and wildlife

The breakdown of traditions and questioning of social institutions

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The changes that will be required must be more rapid than we can expect from biological evolution of the species or than we can expect by traditional evolution of social structures and relationships. If a future catastrophic collapse of the society of mankind is to be avoided by appropriate social response, it will be necessary for a well-informed and educated public in each country, and throughout the world, to support and understand policies developed by a wise leadership.

There are those who trust that societies will manage somehow with the aid of yet-to-be-developed and yet-to-be-discovered substitutes and technologies. They restrict their foresight so as to avoid confronting the inevitable impossibility of sustaining the exponential growth curves that describe the development of many components of the environmental problematique. They seem to believe that because mankind has continued to survive up to now he will continue to develop successful responses despite the fact that crises seem to arise with increasing frequency and severity. We are not so sanguine.

We believe it is urgent to begin to understand how beliefs about the environmental problematique are formed, what the content and structure of those beliefs are as held by the broad public and by elite groups in society, and how policies concerned with the environmental problematique are made and implemented. It is self-evident that in the long run beliefs about the environmental problematique, held both by the broad public and by relevant elites, will play a fundamental role in controlling the responses of societies to the various components of the problematique. It is important to understand that beliefs are susceptible to change by the input of new information, the formation of logical connections, and the demonstration of contradictions within the belief structures. In these respects beliefs are more amenable to change than are attitudes or values. Because of this we feel it is important to begin studies now that will enable us to understand how environmental beliefs are formed, how and why they change with time, and how they relate to the behavior of society. Only with this basic understanding will we be prepared locally, nationally, and globally to achieve the rates of social change that will be required to respond successfully to future environmental crises.

We believe it is irresponsible to oppose or ignore research needed to achieve long-term solutions to global problems on the plea that immediate problems are more pressing. At the present time many more resources are devoted to trying to solve immediate problems than are devoted to research applicable to long-term goals. Such a disproportionate emphasis on short-term needs is probably inevitable, but it is myopic in the extreme to assume that the sum of local, short-term, immediate responses will provide us with long-term solutions.

What is the design of the project?

The project is being developed to study environmental belief structures (their formation, content and relationship to future policies) held by the broad public and relevant elite groups in four countries, Brazil, Japan, Norway, and the United States. During the period from June, 1973, to September, 1974, national research teams will be established in each country, the project will be formulated in detail and research instruments will be designed and pre-tested. Field work will begin in September, 1974, in all four countries. Between October, 1973, and May, 1974, three international working sessions will be held with representatives of all four countries present, to insure inclusion of areas of inquiry that are of greatest importance to each country, that project and instrument design is appropriate for each of the four countries, and that cross-national comparability will be possible with respect to a common core of beliefs studied in each country.

The attached diagram depicts the components upon which the study will focus and the connections we see as existing between these components. The beliefs of certain defined populations, as depicted by the circles, are the core of the project. The

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antecedents and consequences of those beliefs, as shown in boxes, will also be studied. As these become known the connections can better be understood. That is, when beliefs of the populations are known and existing policy is identified it becomes possible to study the ways in which beliefs influence policy, the relative strengths with which they influence policy, and--with studies over time--the speed with which policy shifts respond to changes of beliefs. A similar example from the antecedent part of the diagram is that it is only after beliefs and the content of mass media messages are known that the impact of the mass media on the beliefs of different populations can hope to be understood. The most important outcomes of the studies will be the understandings of the nexuses depicted by the lines of influence in the diagram, but essential prerequisites to these understandings are knowledge of the content of the components depicted in the circles and boxes in the diagram, i.e. beliefs.

The beliefs into which inquiry will be made will relate to the range of matters encompassed by the environmental problematique. We will investigate the level and completeness of awareness of the problem, seriousness of the problem, trade-offs seen as dictated by attempts to solve the problem, responsibility for the present state of the problem and for attempts to solve the problem, nature of desired attempts to solve the problem, hope for adequate solutions, magnitude and timing of changes foreseen, and the appropriate role of the different parts of society in reaching solutions. In addition, we will study many facets of the perceptions people hold of environmental quality.

Beliefs will be determined by personal interviews. The interviews will probe to considerable depth using both open-ended and closed questions. They will be conducted so as to avoid shaping the respondents responses initially, while later focusing in more detail on belief content and structure relating to those aspects of the environmental problematique the four research teams agree are most crucial with regard to wide-spread long-range environmental problems and broad-scale long-term attempts at solution.

What can we hope for from these studies?

As stated previously we hope to determine the content and structure of beliefs about the environmental problematique, how those beliefs are formed by their antecedents, and how they shape public policy derived from them. We expect this knowledge to have at least three kinds of benefits: (1) demonstrate information that society needs for policy change, (2) assist in the development of all kinds of educational programs, and (3) assist policy formulation, enactment, and implementation. Because belief systems can facilitate, impede, or foreclose certain policy alternatives, a knowledge of current belief structures will be of immediate value to public policy makers who must devise and choose among policy alternatives on environmental questions. With knowledge of environmental beliefs, societies will be prepared to design educational programs addressed to the broad public and the different elites. Educational programs may then provide people with the information they require to accept and support changes in society needed to reach short-, medium-, and long-range goals. In short, (1) if we know the content of beliefs we may determine what needs to be taught, (2) if we know the factors forming beliefs we may determine how to go about teaching what needs to be taught, and (3) if we understand the beliefs-policy nexus we will know how to maximize the transformation of teaching into policy.

Our goals are to give society a necessary part of the knowledge and understanding it must have to save life support systems for future generations.

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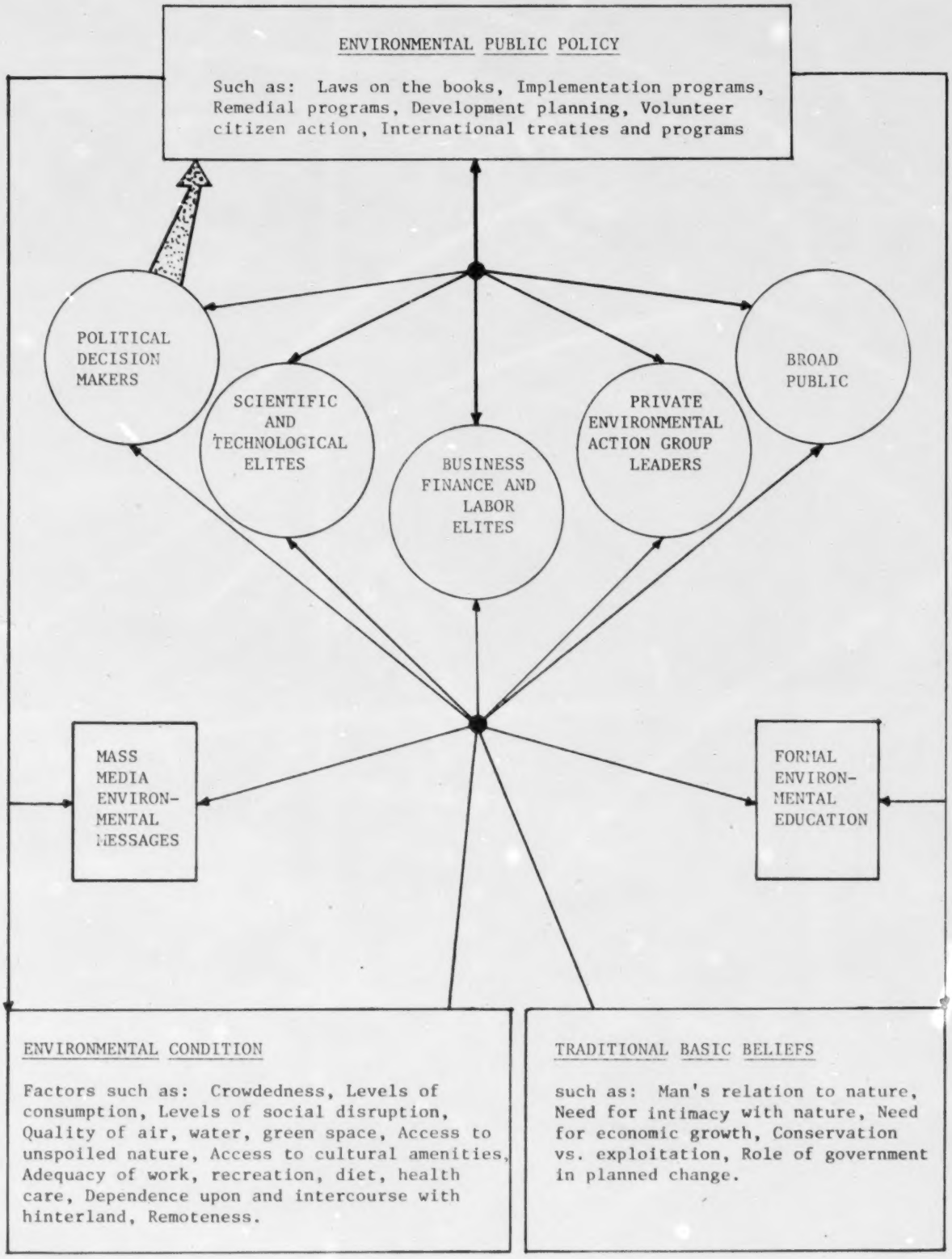
ENVIRONMENTAL PUBLIC POLICY
Such as: Laws on the books, Implementation programs, Remedial programs, Development planning, Volunteer citizen action, International treaties and programs
POLITICAL DECISION MAKERS
SCIENTIFIC AND TECHNOLOGICAL ELITES
BUSINESS FINANCE AND LABOR ELITES
PRIVATE ENVIRONMENTAL ACTION GROUP LEADERS
BROAD PUBLIC
MASS MEDIA ENVIRON-MENTAL MESSAGES
FORMAL ENVIRON-MENTAL EDUCATION
ENVIRONMENTAL CONDITION
Factors such as: Crowdedness, Levels of consumption, Levels of social disruption, Quality of air, water, green space, Access to unspoiled nature, Access to cultural amenities, Adequacy of work, recreation, diet, health care, Dependence upon and intercourse with hinterland, Remoteness.
TRADITIONAL BASIC BELIEFS
such as: Man's relation to nature, Need for intimacy with nature, Need for economic growth, Conservation vs. exploitation, Role of government in planned change.

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PROGRESS REPORT AS OF OCTOBER 15, 1973

First International Working Session

The First International Working Session was held over three days (October 1-3, 1973) in the Lord Amherst Motel in Buffalo, New York. The complete roster of participants attended each session with the exception that two persons (Terry Davies and Peter McDonough) left at the end of the second day because of other commitments and two (Peter House and Robert Livingston) attended for just five hours.

There were no prepared papers. All the participants worked together informally in a single group chaired either by Les Milbrath or Paul Reitan. Smaller work groups were not used, but significant small group discussion occurred outside the scheduled sessions. The agenda outlines the major topics covered. It was necessary to introduce the major themes for the working session, to provide opportunity for the participants to raise many questions, and for all participants to clearly understand the general outlines of the project before specific decisions could be taken.

Teams from the participating countries readily agreed on the common central base of the project. Beyond that, however, there was some divergence in interests. The Japanese participants, for example, emphasized that they hoped the project would focus on the nexus between beliefs and policy as well as on beliefs per se. It also was clear that they wished the project to proceed as quickly as possible because they have some specific programs that they wish to implement very soon and hope that the project can be of immediate help to them. The Brazilian delegate felt that the project must give some attention to problems of growth and development as well as to more overt environmental problems. Norway's representative expressed special interest in his country in how antecedents to beliefs contribute to the content and form of those beliefs. Despite these minor divergencies a fairly extensive list of agreements was reached. These agreements are summarized in the next section.

Additionally, it was agreed the next working session would be held after the survey research instrument had been designed and tested through two iterations, and the results distributed to all participants for their consideration. The best possible times were thought to be mid-December or late January. During the interim, teams in each country would be working on recruitment of a full team, developing a tentative project budget and opening up contacts for a possible solicitation of project funding. The tasks to be done before the next working session are summarized in the last section of this report.

Agenda

Monday, October 1

A. Introduction of Participants
B. Background and Broad Summary of Project
C. Overview of Methods and Time Plan for Research
D. Long Range Plans for Future Studies

Tuesday, October 2

A. Detailed Review of Working Paper
B. Preferred Topics of Inquiry
   1. Suggestions by participants from Brazil, Japan, Norway, and U.S.
   2. Criteria for deciding priorities

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Wednesday, October 3

A. Mechanics and Problems of Conducting the Study in Each Country
B. Problems of Financing the Study in Each Country
C. Correlative Studies in Each Country

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Agreements

1. Focus on beliefs of broad public and elites and on the nexus between beliefs and policy. Some countries may choose to emphasize the study of antecedents of beliefs as well.

2. Interview a random sample of the broad public selected by area probability method, with a goal of not less than 1500 for a national sample. We leave open the question of age boundaries on the sample until future international working sessions.

3. Use much the same interview schedule for elites as for the broad public. Choose the sample of elites by position. Specific criteria for inclusion in elite population postponed until next international working session.

4. Elite positional sample will include leaders of citizens environmental action groups as well as political-governmental elites, scientific-technological elites, and business-financial-labor elites.

5. Ask elite respondents for nominees of persons influential for raising, defining, and resolving environmental problems--this "snowball" sample also to be interviewed.

6. Subsequent to elite interviews national teams are encouraged to send selected elites a series of delphi questionnaires for the purpose of measuring strength and mobility of some beliefs.

7. Development of interview schedule to go forward at Buffalo with a tentative draft to be presented to the next international working session. Other national teams are also free to work on development of an interview schedule, but we all must work toward agreement on a final version to be used in all four countries.

8. The study is more valuable for policymaking relating to problems of long range significance; hence belief inquiry areas should be chosen with this in mind.

9. Many suggestions for inquiry areas have been received and noted. Final decisions on inclusion are postponed to subsequent international working sessions.

10. National teams will be allowed to inquire into topics of special national concern in addition to the standard cross-national interview schedule (see agreements #7 & #8) of about 50-minutes duration.

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11. The next international working session will be held in December or January. Specific date depends partly on progress on interview schedule and partly on avoiding conflicts with other meetings.

12. Still undecided--whether or not to have a special segment of inquiry on a more focused environmental policy area; e.g., energy policy or land use policy or development policy or life styles. We shall experiment with "special segment" questions and report to the next international working session.

13. On beliefs-policy nexus: cross-national comparisons are most appropriate for the beliefs of elites and the broad public on policy preferences and for the examination of the roles elites play in the policy process. Other matters, such as the mechanics of implementing beliefs in the policy making process, are more culture specific.

Status of the national teams

Norway

The project will be headquartered at the Institute for Social Research, Munthesgate 31, in Oslo. It will be administered in the Social Ecology Division of that Institute under the direction of Dr. William Lafferty. Mr. Larry Rose may become team leader. Other team members known at this time are Karl Kristian Hauge, and Svein Møthe. The selection of additional members for the team awaits the designation of a team leader.

Japan

The team in Japan will be headquartered at the Institute for Future Technology under the overall direction of Professor Yujiro Hayashi. Professor Hidetoshi Kato has been designated as team leader. Additional team members will be drawn from the Institute for Future Technology and some social scientists will be added to the team from collaborating universities in Japan.

Brazil

In Brazil the responsibility for building the team is shared between Professor Fanny Tabak of the Pontificia Universidade Catolica do Rio de Janeiro and Professor Candido Mendes of the Instituto Universitario de Pesquisas de Rio de Janeiro.

United States

The U.S. team will be headquartered at the Social Science Research Institute of State University of New York at Buffalo, directed by Professor Lester Milbrath. Professor Paul Reitan, Associate Provost of Natural Sciences at SUNYAB is co-director. Other team members are: Theodore Hullar, Associate Professor of Medicinal Chemistry, John Thomas, Associate Professor of Policy Studies, and Rainer Hasenstab, Associate Professor of Environmental Design. Five student assistants also are working with the team, they are: Robert Sahr, Benson Nadell, Jon Czarnecki, Tom Oliphant and George Wirth.

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Tasks to be done before next International Working Session

	Principal responsibility	Supporting responsibility
Design of Instrument		
Develop instrument (2 iterations)	American team	National teams which are interested
Exchange instruments	American team	Others who develop and review instruments
Design of the Study		
Prepare ideas for elite selection	American team	
Prepare ideas for studying beliefs-policy nexus	American team	
Finances		
Develop tentative budget for each country	Each team	American team
Develop contacts for possible funding	Each team	American team
Team formation		
Obtain full membership of teams	Team leaders	Les Milbrath
Contact with other agencies		
Establish contact with MAB Project 13 and UN Environmental Program	American team	----------
Identify collaborating groups in each country	Each team	----------
Develop contacts with policy-makers and review proposed project purposes with them	Each team	

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INSTITUTE FOR FUTURE TECHNOLOGY

PROJECT FOR ENVIRONMENTAL EVALUATION

(Outline)

This project aims at finding out how the people evaluate the everyday-life environment. The result will be useful for recognizing the condition of our environment and for designing development plans.

This method we introduce here is to request people to take photos of desirable (agreeable, preferable) or undesirable places or scenes in their town (city) and to rate the extent of desirability of the places or scenes. (See the attached.) The limitation of this method is that it is impossible to take photos of invisible aspects of places or scenes. The method of analyzing the photos and ratings is to verify hypotheses on which elements of everyday-life environment are of keen concern or on the reasons why they are of so much concern. Two examples of such hypotheses are: "The roads are of most concern in the Japanese everyday-life environment," "The places where people feel at ease in Japanese urban life are the parks and precincts of shrines."

Now we are in the stage of analyzing the 4,600 sheets of photos received from 90 persons who live from the north to the south of Japan.

This project would be especially meaningful if we could compare the results internationally, in order to promote mutual understanding of the perception and evaluation of everyday-life environment in other countries. For this reason we would like to perform the same research in Asian countries and the United States.

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(Sample Questionnaire)

Address:_____

Name:_____Sex:_____Age:_____

Occupation or School:_____

Let us rate places or scenes in your town (city) as to whether they are desirable (agreeable, preferable) or undesirable (unagreeable, not preferable).

Please attach photo here.

What did you intend to show?

Rating

How do you rate this place or scene?

1. Very desirable 2. Slightly desirable 3. Slightly undesirable
2. Very undesirable

Why do you think as above?

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